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DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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Development
of
WATER RESOURCES
in
APPALACHIA

MAIN REPORT
PART V
STATE WATER SUPPLEMENTS

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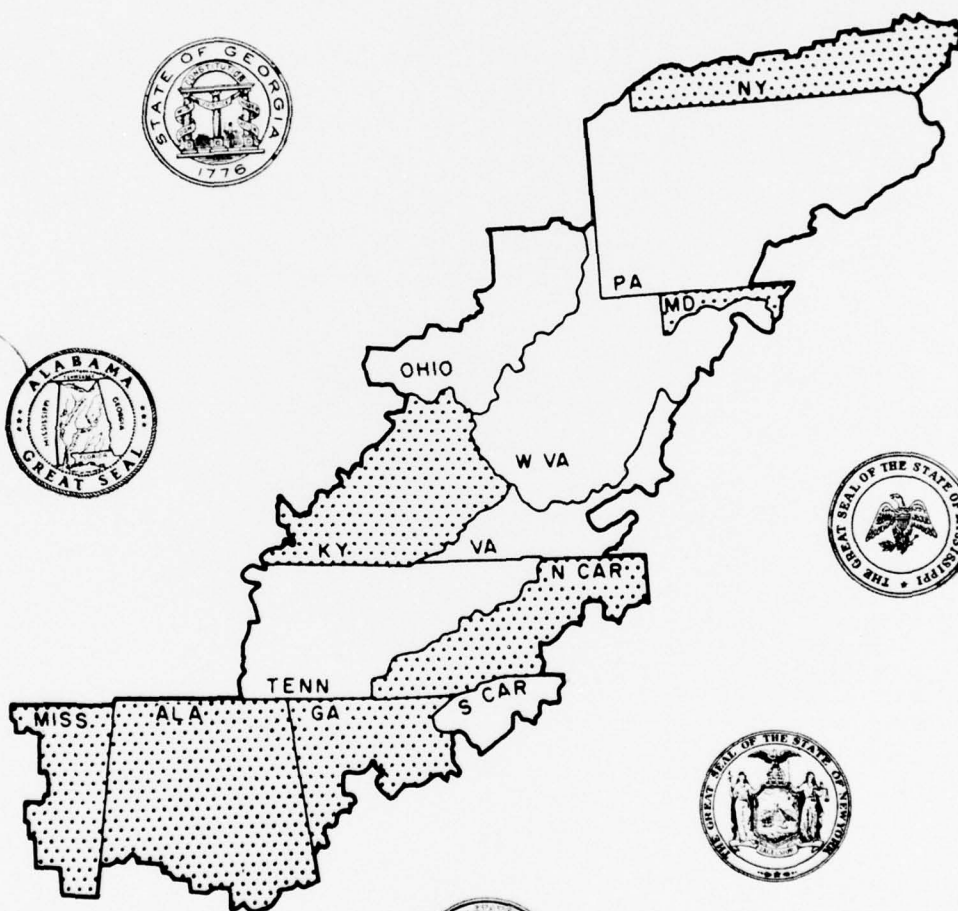
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THIRTEEN APPALACHIAN STATES



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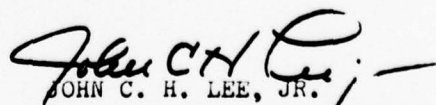
TO: THE READER

This volume (Number 13) is one of two that comprise Part V, "State Water Supplements," to the Main Report for Development of Water Resources in Appalachia. The volume contains, in order, the supplements prepared by the States of Alabama, Georgia, Kentucky, Maryland, Mississippi, New York and North Carolina. Supplements for the remaining six States in the Appalachian Region are contained in Volume 14.

During the study, State Representatives to the Water Development Coordinating Committee for Appalachia decided that they wished to present their evolving state water plans in the report. Each state has presented its plans, projects and future hopes covering development and management of the state's water and related resources. Some states have presented detailed analyses and proposed further extensive studies; others reflect an opinion that the present level of management of water resources is generally adequate and, in their State Water Supplements, have presented statements of support for going programs. These reports present the views of the individual States. Volumes 13 and 14 of this report will undoubtedly become a benchmark in State participation in water resources planning.

In addition to these supplements, the four Southern Appalachian States of South Carolina, Georgia, Alabama and Mississippi, also provided reports concerning their Laws, Policies and Programs pertaining to water and related land resources. These four documents are contained in Part VI (History, Coordination and Cooperation) of this report. Similar information had previously been prepared by the other 9 Appalachian States for inclusion in the published Ohio River Basin Comprehensive Survey. Those 9 documents are contained in Appendix J (Volume XI) of that report.

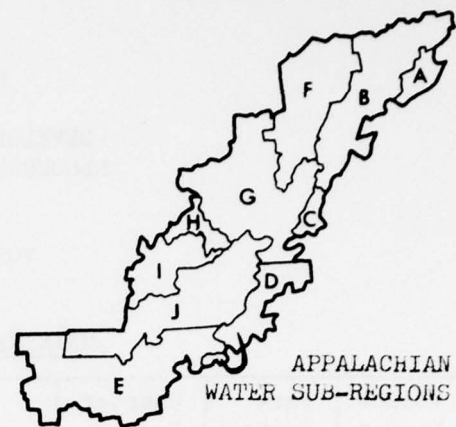
Programs and projects recommended in the State Water Supplements have been helpful in formulating the plans for water resources development presented elsewhere in this report. A full index of all report components is included on the following two pages.


JOHN C. H. LEE, JR.
Colonel, Corps of Engineers
Director

REPORT
For
DEVELOPMENT OF WATER
RESOURCES IN APPALACHIA

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For
DEVELOPMENT FOR WATER
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PART V. Volume 4 13.
STATE WATER SUPPLEMENTS •

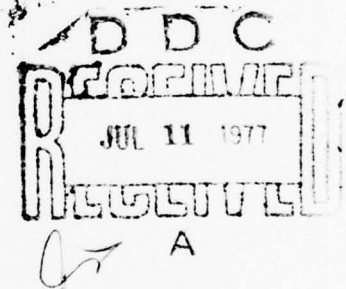
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April 1969

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OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 1
ALABAMA WATER SUPPLEMENT

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1968

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CHAPTER 1
ALABAMA WATER SUPPLEMENT

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I. INTRODUCTION

1. Purpose

The purpose of the Alabama State Supplement is to provide information pertaining to water resources and related problems in Appalachia Alabama for consideration of Federal agencies involved in preparing the Sub-Regional components of the Report for Development of Water Resources in Appalachia required by Section 206 of the Appalachian Development Act of 1965.

2. Scope

This Supplement includes (a) a re-statement of the goals and objectives adopted for the Development Plan for Appalachia Alabama; (b) identification of water quality and quantity problems aimed toward alleviation of specific problems; and (c) a list of current and pending programs aimed to alleviate specific problems; and (d) a statement of aspirations, plans and objectives of the State which will contribute to economic growth and opportunities for its citizens.

3. Acknowledgements

Cooperation of the following organizations is acknowledged:

Auburn University
Department of Conservation
Water Improvement Commission
Department of Public Health
Geological Survey of Alabama
State Planning and Industrial
Development Board
Federal Programs Coordinating Committee
Coosa-Alabama River Improvement Association
Warrior-Tombigbee Development Association
Tennessee Valley Authority
State Highway Department
Bear Creek Watershed Authority
University of Alabama
County and City Officials, Commissions,
and Boards
U.S. Army Corps of Engineers, Mobile District

II. GOALS AND OBJECTIVES

4. General

As in the major part of southern Appalachia, Alabama is in a period of transition from an agricultural economy characteristic of most of the South to an urban, industrial economy. The principal deterrents to future growth in the area appear to be deficiencies in education and skill of many rural families, the lack of adequate urban services and facilities and insufficient private and public investment capital to create jobs.

5. Goals and Objectives

The overall objectives of the Appalachian Program in Alabama are (1) to provide, where possible and necessary, investment incentives and programs which will increase an area's ability to adjust to a better mix of economic activities; (2) to accelerate the transition period by stimulating local development and upgrading the standard of education at all levels; and (3) to assure to the extent possible, that "The Public Investments made in a region under this Act shall be concentrated in areas where there is a significant potential for future growth, and where the expected return on public dollars invested will be the greatest."

Development of water resources in Appalachia Alabama will be accomplished to contribute to the attainment of the overall goals and objectives. It is also the objective of the State to coordinate its programs through comprehensive planning in order to assure attainment of these goals.

III. WATER ORIENTED PROBLEMS

6. General

Certain areas of Appalachia Alabama have enjoyed economic growth because of the abundance of water resources which have been developed for navigation, industrial, and other uses. This has had a pronounced influence in these areas but at the same time has generated water related problems which will tend to restrain further growth if not resolved. Other areas of Appalachia in Alabama have experienced little or no economic development although an abundant water supply is available in many of the areas. From this anomalous state of affairs it can be inferred that an abundant water supply is only one of many factors which determines whether or not an area will experience growth. An analysis of these factors is beyond the scope of this Supplement. This discussion is, therefore, confined to problems associated with economic growth related to water resources.

7. Low Flow

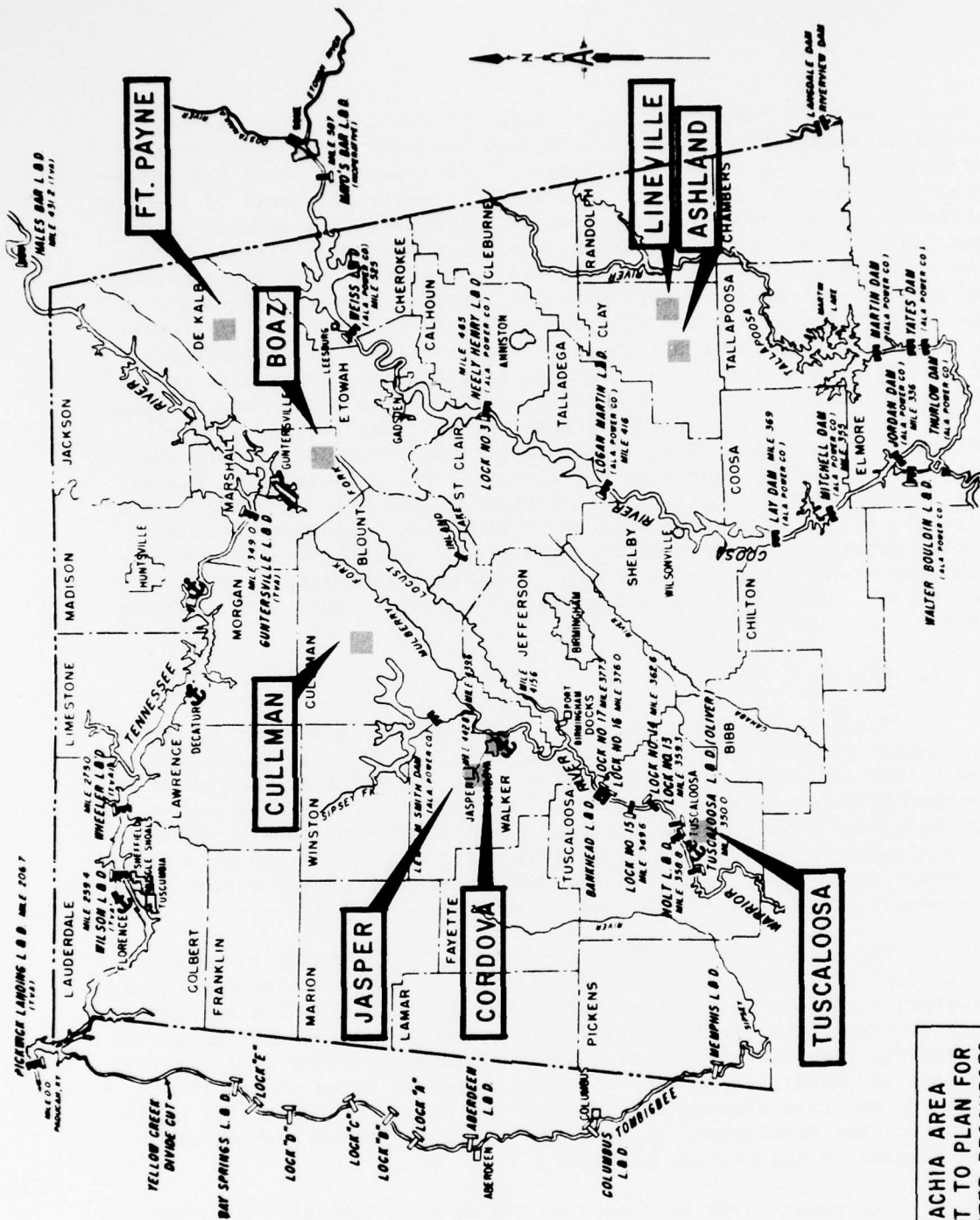
Geologic formations in the area provide groundwater storage capable of maintaining a base stream flow sufficient for most domestic and municipal water supply requirements. An expanding urban and industrial society with its resulting increase in waste effluents is placing excessive demands upon the assimilative capacity of the streams of the area, thus resulting in increasing requirements for low flow augmentation. The State of Alabama has enacted legislation requiring appropriate waste treatment, but, even with the maximum treatment that is imposed upon industrial and municipal sources, difficulties will exist in protecting some streams from an undesirable level of pollution during low flow periods. For example, a serious problem exists in the tributaries of the Locust and Mulberry Forks of the Black Warrior River as the result of extremely low seasonal flows. The average flow of Mulberry Fork at Garden City is 180 cubic feet per second (cfs); however, five percent of the time the flow is 8 cfs or less. The minimum flow includes 3.5 cfs of sewage discharged by the City of Cullman to a tributary of the Mulberry Fork above Garden City. Another serious problem exists in the City of Tuscaloosa which greatly inhibits industrial expansion and economic growth. Similar problems exist at Boaz, Fort Payne, Jasper-Cordova, and Ashland-Lineville. These are shown on Figure 1.

8. Floods

Positive flood control is not an academic consideration in Appalachia Alabama. The taming of the Tennessee River in North Alabama by the Tennessee Valley Authority is an accomplished fact which has permitted development of water and related resources to a degree far exceeding development in the remainder of the Appalachian portion of the State. Unfortunately, the other river systems in the area have not experienced flood control development needed to permit economic development to keep pace with that of the TVA territory.

The high degree of flood control on the Tennessee River does not at this time, however, provide relief to communities located along tributary streams. Small streams flowing through Huntsville and Athens overflow their banks periodically causing damage to developed areas and interfering with orderly growth. Local flooding problems also exist in Florence and Decatur, but have not been a serious deterrent to growth. Flood control investigations are needed not only throughout this basin to control the development of flood prone areas, but throughout all river basins in Appalachian Alabama.

The possibility of floods on the Warrior-Tombigbee waterway is a serious reality. The solution is associated with management of the headwaters of the Black Warrior River. One of the headwaters, Sipsey Fork, has been improved by the Lewis Smith Dam constructed by the Alabama Power Company. This has contributed materially to flood alleviation. The waters of the two other forks of this river, the Mulberry and Locust, still remain uncontrolled. Despite the major contribution of the Lewis Smith Dam, the



MAJOR LOW FLOW PROBLEM AREAS

FIGURE 1

ALABAMA APPALACHIA AREA
STATE SUPPLEMENT TO PLAN FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA
STATE PLANNING AND INDUSTRIAL
DEVELOPMENT BOARD
JUNE 1966

most disastrous floods in history occurred in 1960-61 in the reaches of the Warrior River at and above Demopolis, at Tuscaloosa, and in Jefferson County, resulting in both rural and urban devastation. The U.S. Department of Commerce Weather Bureau reported \$525,000 in damage in April, 1960; \$3,300,000 in February, 1961; and just under \$3,000,000 in December 1961.

About 74% of the run-off of the entire headwaters area is carried by Mulberry Fork (49%) and Locust Fork (25%). An initial study by the Corps of Engineers, based on the benefits-to-cost ratio, did not recommend improvements such as the dams at the Dorsey Creek and the Smiths Ford sites. It seems possible that, after the 1961 floods which established new records, changing conditions may have materially altered the base on which the benefits-to-cost ratio was established in the earlier report and thereafter included in House Document 414.

Similar problems exist on the Alabama-Coosa River system.

9. Water Supply

Within Appalachia Alabama, additional municipal water supplies have been provided or are being planned. Insufficient sources or inadequate facilities still exist at Guin-Winfield, Haleyville, Heflin, Piedmont, Oakman, Clanton, Berry, Rockford, LaFayette, Brent, Addison, Bear Creek, Scottsboro and the Birmingham metropolitan area. These are shown on Figure 2.

10. Water Quality

Natural influences - climate, topography, and geology contribute to the range in mineral content of surface water and ground water.

In general, the quality of surface water is adequate for most uses in the entire Appalachian region. The only treatment that is needed is chlorination and the removal of sediments. In some streams the water temperature may vary as much as 15° in a day.

The quality of groundwater may be influenced by the geology of an area. Groundwater in the Piedmont is relatively free of mineral matter; locally iron content may be excessive and the water may be corrosive. Water in the rocks of the Eastern Plateau is generally of good quality, although water stored in sandstone and shale sometimes contains objectionable amounts of iron. Water developed from limestone is moderately hard, and requires treatment only for specialized use. In some areas of the Coastal Plain only highly mineralized water is available, but in most areas it is possible to obtain water low in mineral content by drilling to a selected formation.

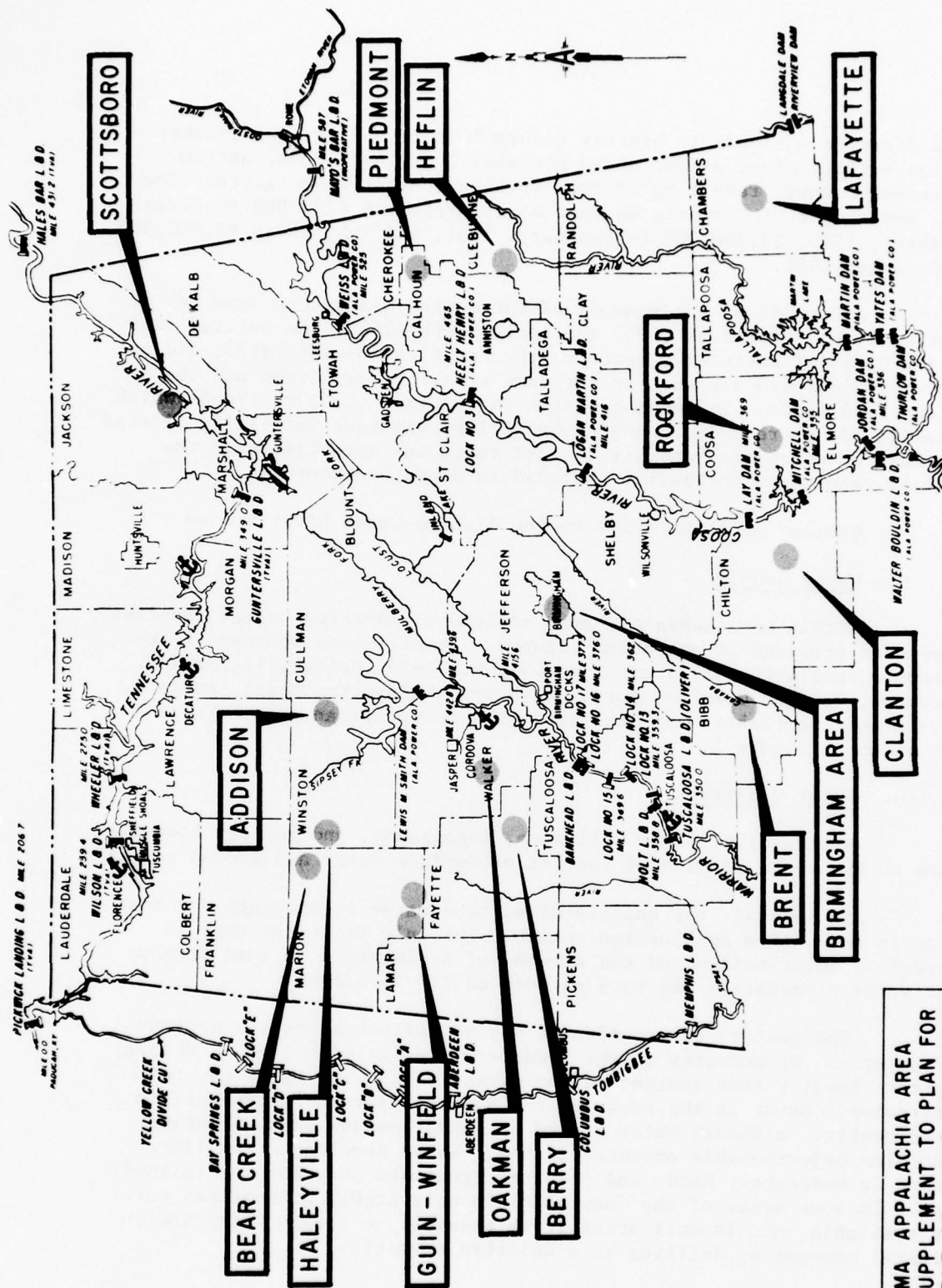


FIGURE 2

ALABAMA APPALACHIA AREA
STATE SUPPLEMENT TO PLAN FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA

STATE PLANNING AND INDUSTRIAL
DEVELOPMENT BOARD
JUNE 1968

11. Waste Disposal

Disposal of urban waste, both municipal and industrial, is a problem of increasing magnitude accompanying development of any region. In Alabama, the problem is one of geometric proportions as a result of a rapidly expanding urban and industrial economy, and also as a result of pollution abatement legislation which is requiring industry and urban communities to practice a higher level of waste treatment.

12. Pollution

The State of Alabama Water Improvement Commission was established in 1947. One of the functions of the Commission is to establish criteria for acceptable limits of pollution. In connection with the recently adopted water quality standards, all sources of municipal and industrial waste being discharged into Alabama waters were surveyed by the Commission. The following are the results of the survey by river basins in Appalachia Alabama as of November 1967:

BLACK WARRIOR RIVER BASIN

Municipal Waste Treatment: In the Black Warrior River basin 11 municipalities with 15 plants have been determined to be providing adequate waste treatment. Two municipalities provide no treatment and six provide inadequate treatment.

Industrial Waste Treatment: In the Black Warrior River basin 61 sources of industrial waste were studied. They included 34 from manufacturers, 22 from coal washers and five from sand and gravel washers. Of the 34 sources for manufacturing three provide an adequate degree of treatment and 31 an inadequate degree. Of the 22 coal washers, 14 provide an adequate degree of treatment and eight an inadequate degree. Of the six sand and gravel washers, five provide an inadequate degree of treatment.

CAHABA RIVER BASIN

Municipal Waste Treatment: In the Cahaba River basin, five plants in four municipalities have been determined to be providing an adequate degree of treatment. Also determined adequate is the Patton Creek Plant which serves parts of Vestavia and adjoining incorporated areas and the Shades Creek Plant which serves Homewood, Irondale, and parts of Birmingham and Mountain Brook. Both the Patton Creek and Shades Creek plants are operated by the Jefferson County Commission. There are four municipalities that are providing an adequate degree of treatment.

Industrial Waste Treatment: In the Cahaba River basin,

10 sources of industrial waste were studied. Included were four from manufacturers, five from coal washers and one from sand and gravel washer. Two manufacturing and two coal washer sources were determined to be providing an inadequate degree of treatment.

CHATTAHOOCHEE RIVER BASIN

In Appalachia Alabama parts of Chambers and Randolph Counties are in the Chattahoochee River Basin. Within this area, four municipalities provide no treatment and one provides inadequate treatment. There are also four sources of untreated industrial waste.

COOSA RIVER BASIN

Municipal Waste Treatment: In the Coosa River Basin 16 municipalities with 19 plants have been determined to be providing an adequate degree of treatment. Three give no treatment and six provide inadequate treatment.

Industrial Waste Treatment: There are 12 industries in the Coosa River Basin that provide no treatment or the degree of treatment is inadequate.

TALLAPOOSA RIVER BASIN

Municipal Waste Treatment: In the Tallapoosa River Basin there are 15 plants being operated by nine municipalities in Appalachia Alabama. Eight of the plants are providing an adequate degree of treatment and seven an inadequate degree.

Industrial Waste Treatment: There are six sources of industrial waste discharging into waters of the Tallapoosa River Basin. Four of them are providing an inadequate degree of treatment.

TENNESSEE RIVER BASIN

Municipal Waste Treatment: In the Tennessee River Basin, the water treatment facilities in 14 municipalities were surveyed. Only Bridgeport in Jackson County provides no treatment. The others operate 23 treatment plants of which seven have been classified as inadequate.

Industrial Waste Treatment: There are 24 sources of industrial waste discharging into the waters of the Tennessee River Basin. Six are providing an inadequate degree of treatment.

UPPER TOMBIGBEE RIVER BASIN

Municipal Waste Treatment: In the Upper Tombigbee River Basin the waste treatment facilities of 11 municipalities were surveyed. The Town of Guin in Marion County and Sulligent in Lamar County provide no treatment. The others operate ten plants of which five have been classified as inadequate.

Industrial Waste Treatment: There are ten sources of industrial waste discharging into the waters of the Upper Tombigbee River Basin. Two are not providing an adequate degree of treatment.

13. Navigation

There are two operational river navigation systems and one authorized system affecting Appalachia Alabama. The Tennessee River system in North Alabama carries approximately 20 million tons of cargo annually. The Black Warrior River System is navigable between the Port of Birmingham and Demopolis at which point the stream joins the Tombigbee system and continues to Mobile. The annual traffic over the composite Warrior-Tombigbee waterway in 1966 was over 8 million tons. The authorized navigation system, the Coosa River from Montgomery to Gadsden, Alabama, and thence to Rome, Georgia, is discussed later in paragraph 29. With the completion of the Holt Lock and Dam in late 1968, the Black Warrior-Tombigbee system will include six locks whereas there were originally seventeen. Two bottlenecks will still exist, the narrow lock at Oliver Dam and the outmoded tandem locks at Bankhead Dam. Advanced planning is underway to design a single lift lock at the Bankhead Dam. The solution of these problems will bring about full realization of the benefits of the modernization program.

14. Need for Comprehensive Water Planning

The several agencies in Alabama working in water-oriented activities have established avenues of communications and cooperation, but the desired degree of coordination in the area of comprehensive planning has not been achieved. Various agencies collect, process and store water and supporting data prerequisite to planning. Exchange of and access to information needs to be arranged, and duplication of procedures should be eliminated where indicated. Until a mechanism for comprehensive planning has been developed, a satisfactory degree of effectiveness in water resources management cannot be achieved.

15. Legal Aspects

Legislation to modernize Alabama statutes dealing with water use, water quality and water management is needed.

IV. WATER ORIENTED PROGRAMS

16. General

Programs and activities now in progress which affect Appalachia Alabama are outlined in the following paragraphs.

17. Low Flow Augmentation

The primary purpose of low-flow augmentation is usually considered to be the dilution of wastes, but equally important is its use to provide minimum channel depths for navigation. In this sense, most headwater reservoirs emptying into navigable streams have part of their storage pool committed to low-flow augmentation. There is no program in Alabama having as its primary purpose low-flow augmentation, although all major structures now funded provide low-flow augmentation as a secondary benefit.

18. Flood Plain Information

Flood plain information studies are urgently needed for the entire State of Alabama, and particularly in the Appalachian area. Flood-plain information studies are needed so that best land-use practices can be identified in light of flooding conditions. The availability of this information will enable localities to assign the best use to lands and to develop this resource accordingly. The resulting information may also identify needed protective facilities. Since November, 1965, all requests for flood plain information studies are submitted through the State Planning and Industrial Development Board which has been working closely with the Corps of Engineers, Mobile District, and the Tennessee Valley Authority in obtaining the maximum studies that available funds permit. Numerous areas in need of flood plain information have been identified. Currently underway in Appalachia Alabama are a Survey Report for Flood Control on Shades Creek and a Flood Plain Information Report on Five Mile Creek both in the vicinity of Birmingham.

19. Water Supply

A "Chicken or egg" situation exists in some Appalachian communities in Alabama with respect to water supply. Inasmuch as the water supply is inadequate to support the existing sub-standard economy, no further economic growth can occur. And, to the contrary, without potential economic growth, an adequate water supply cannot be obtained. Although there are several federal programs which provide generous assistance to communities for the development and expansion of water supply systems, some communities often are unable to take advantage of available assistance because they cannot provide the non-federal funds required for water supply programs.

Until this dilemma can be satisfactorily resolved, there is no obvious way that the affected communities can enjoy the economic growth projected for the Appalachian area.

About 37 communities have, however, been able to participate in available programs involving Federal assistance and 29 others have application in the preparatory stage. Information about current or planned programs has been supplied to the Appalachian Regional Commission by the agencies that administer the various Federal Programs.

20. Water Quality

There are several State, Federal, and private agencies with active water-quality programs.

The Geological Survey of Alabama, in cooperation with the U.S. Geological Survey, has for many years operated a water resource basic data program which includes water quality information.

The University of Alabama and Auburn University have many research activities which are water quality oriented.

The Tennessee Valley Authority maintains an active program of water quality monitoring in the TVA lakes and in numerous tributary streams in northern Alabama. In cooperation with the U.S. Forest Service, TVA is conducting in the upper Bear Creek area a watershed hydrology research project designed to provide baseline information useful in planning the development of water resources.

The State Department of Conservation has long maintained interest in the quality of surface water in streams in the State.

The program of the U.S. Army Corps of Engineers now includes specific concern for maintaining or improving surface water quality. Public utilities and private industrial organizations have without exception inaugurated water quality monitoring programs.

State and Federal soil conservation programs have been developed which have greatly reduced serious silting problems that existed previously in many streams.

Several other State and Federal agencies participate in water quality programs.

21. Waste Disposal

The Water Improvement Commission has, since 1965, required minimum primary treatment of all municipal and industrial waste discharged into streams. This, however, appeared to be inadequate as a

general application to maintain the desired BOD level. As a result, the Water Improvement Commission adopted on May 5, 1967, water quality criteria and standards which include secondary treatment of effluent material destined for streams.

Other means of combatting the problem of waste disposal are being sought, and sources other than streams must be considered to accommodate the ever-increasing volume of solid, liquid, and chemical effluents.

Underground facilities such as deep wells and abandoned mines offer one solution. Land-fill disposal of solids is another alternative, and possibly selected solid wastes may be processed and utilized as fertilizer on an economic basis. Research in this field is urgently needed and is being encouraged. In Alabama, public agencies qualified to deal with waste disposal have a coordinated program underway, and industries are moving to solve their problems.

22. Pollution Abatement and Control

The Water Improvement Commission provides control of pollution of the ground water and surface water of the State. One of the principal functions of the Commission is to issue permits for the discharge of sewage and industrial and other waste into State waters. Such permission is granted upon approval by the Commission of applications, plans, and specifications. The statute establishing the Commission contained a "grandfather" clause which exempted existing waste sources from compliance. During the 1965 regular session, the State Legislature enacted a water pollution bill which put all sources of waste pollution under the Commission's jurisdiction, and also established a maximum permissible time of 8 years for previously exempted waste sources to comply with treatment requirements deemed necessary by the Commission. Of the sources of pollution mentioned in paragraph 12 that are receiving no treatment or inadequate treatment, the Commission has an active program to assure adequate treatment is provided and maintained.

Water quality criteria and standards for interstate streams of Alabama have been promulgated by the Commission and submitted for approval under provisions of the Federal Water Quality Act of 1965. In addition, the Commission is preparing water-quality criteria and standards for intrastate streams. Monitoring programs of the Commission, Federal Agencies, and industries are rapidly expanding. Approximately ten years ago the Commission requested major industries discharging significant quantities of waste to routinely monitor waste treatment systems, and waters receiving the waste, and report results to the Commission on a voluntary basis. Cooperation received from these industries was gratifying and the success of this voluntary program has led to monitoring of waste treatment systems and receiving streams being

included as a condition of permits issued for the discharge of waste by industries contributing significant waste flows. It is planned to extend this requirement to major municipalities within the State of which a significant number are currently monitoring the performance of sewage treatment plants.

23. Navigation

As discussed earlier, a modernization program for the Black Warrior-Tombigbee navigation channel has progressed to an advanced state. The projects which were funded will be completed in the ensuing two years, but the bottlenecks created by the underdesigned locks at Oliver Dam and Bankhead Dam still remain. (See paragraph 9). Alabama Power Company, through a series of seven dams on the Coosa River at a cost of 194 million dollars, is expected to complete proposed hydro-electric power facilities in June 1968. The Power Company assumed additional expense in the design and construction of facilities so that Federal funds required for navigation to complete the authorized Alabama-Coosa River System will be minimized.

24. Comprehensive Water Planning

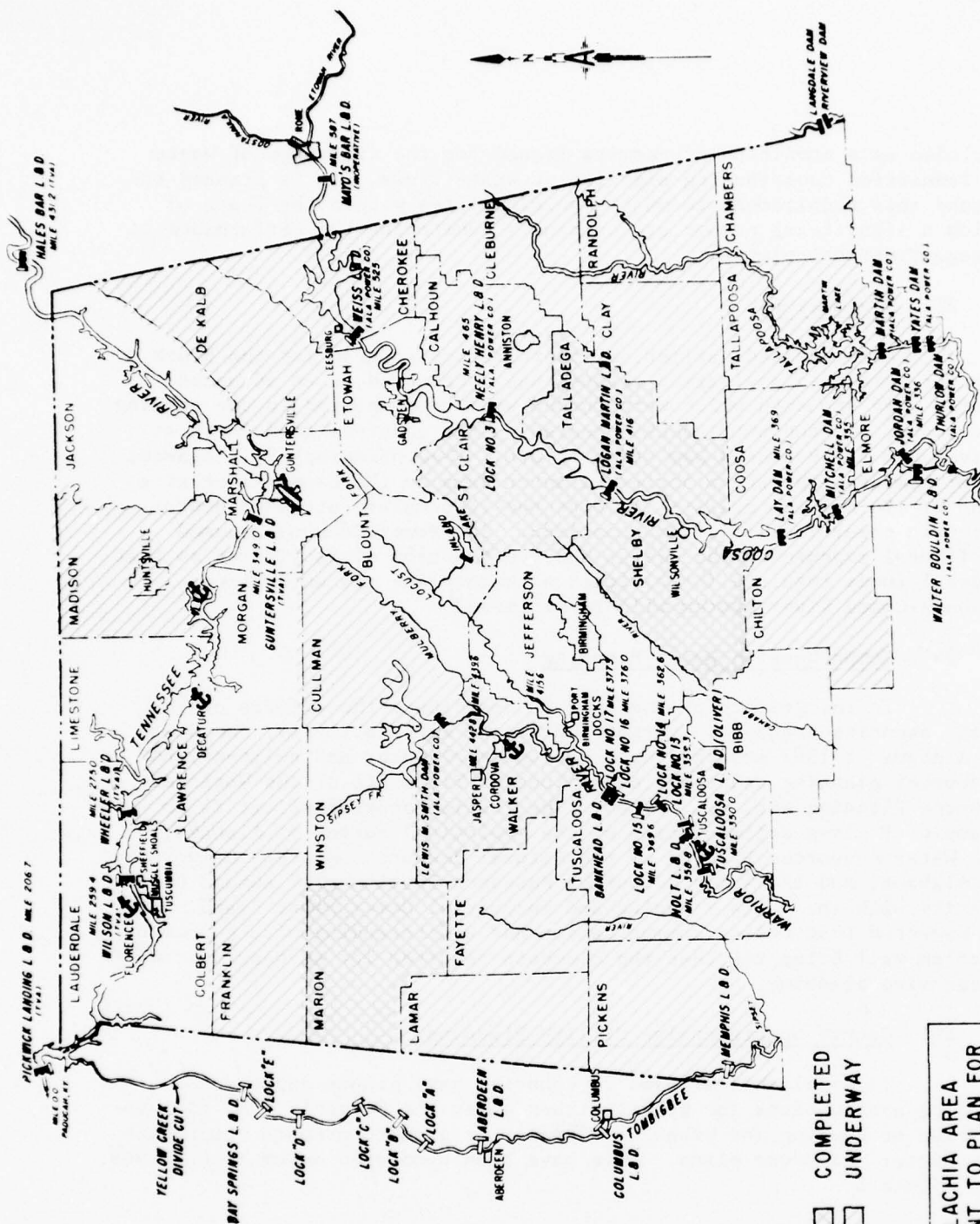
In recognition of the need to coordinate the efforts of the state agencies engaged in various phases of water activity, the State of Alabama in 1967 embarked upon a program of water and related land resources planning under the provisions of Title III of the Water Resources Planning Act, P.L. 89-80. The initial program effort is an example of close collaboration of the Geological Survey of Alabama, the Water Resources Program of the Natural Resources Center, University of Alabama, and the Water Resources Research Institute of Auburn University with the State Planning and Industrial Development Board. It is expected that better communication and understanding of the common problem will bring together the elements required for successful comprehensive planning.

25. County Comprehensive Utility Planning

In Appalachia Alabama 23 counties have either approved or pending applications for grants either under the Farmer's Home Administration or Housing and Urban Development program to prepare comprehensive water and sewer plans. Five have been completed as of 1 June 1968. See Figure 3.

In Jefferson County, a five-year sewer improvement program was adopted in 1966 and is in the process of being implemented. The Birmingham Water Board is in the process of developing a water system plan for the urban area which will extend well beyond the city limits.

26. Recreation



COUNTY COMPREHENSIVE UTILITY PLANNING

FIGURE 3

ALABAMA APPALACHIA AREA
STATE SUPPLEMENT TO PLAN FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA

STATE PLANNING AND INDUSTRIAL
DEVELOPMENT BOARD
JUNE 1968

There are many existing water oriented recreational developments in Appalachian Alabama. Facilities range from extensive multi-purpose complexes to nominal installations. The following are representative of types now being provided or planned:

a. Chilton County in 1965 adopted an ambitious program for an expanded public parks system and acquired additional property. Facilities are being developed and programmed to enable the public to better utilize and enjoy Lay and Mitchell Lakes on the Coosa River.

b. Madison County and the town of Triana are developing an 88-acre recreational park on the Tennessee River. It is the first major county park in Madison County. Facilities will include a boat landing, nature trails, picnic tables, and pavilions.

c. In North Alabama, 17 Chambers of Commerce have formed the Alabama Mountain Lakes Association to develop and promote recreation development throughout North Alabama.

d. All lakes developed for hydroelectric purposes by the Corps of Engineers, Tennessee Valley Authority and by Alabama Power Company have built-in provisions for maximum utilization of such facilities for recreation.

27. Law

The Geological Survey of Alabama has prepared for early publication a compilation of statutes relating to water use as well as important State Supreme Court decisions which concern the use, control, and management of the State's waters and waterways. The compilation is prepared under the Appalachian Regional Development Act.

The program of the Water Resources Research Institute at Auburn University includes a research project entitled, "Some Legal Aspects of Water Resource Use with Respect to Economic Development in Alabama". The research is making use of the compilation of statutes prepared by the Geological Survey of Alabama and other data developed on the project to examine the socio-economic phases of water resource use in economic development, stressing the legal aspects with implications for the present and future. Specific objectives of the study are (1) to isolate socio-economic problems existing in Alabama which are the result of inadequacies in present water use laws, and (2) to illustrate possible solutions to problems of water use and to model legislative proposals with their implications on economic development in Alabama in the future.

V. PLANS, OBJECTIVES, AND ASPIRATIONS

28. General

This section outlines some of the more important aspirations for Appalachia Alabama.

29. Alabama-Coosa River System

The River and Harbor Act adopted March 2, 1945 (Public Law 14, 79th Congress, First Session) authorized the initial and ultimate development of the Alabama-Coosa River and tributaries for navigation, flood control, power development and other purposes. The 83rd Congress, Second Session, enacted Public Law 436 which suspended hydroelectric power development of the Coosa River by the Corps of Engineers, and permitted private capital to develop this additional power source.

It appears that the Alabama River will be navigable from the Port of Mobile to Montgomery by 1971. The Bureau of the Budget in January 1960 recommended that the development of the Coosa River for navigation from Montgomery to Gadsden, Alabama be delayed until the waterway from Mobile to Montgomery is assured. Also, the reach between Gadsden and Rome, Georgia, will be delayed pending an economic restudy and until the waterway between Montgomery and Gadsden is assured. The FY 1967 Public Works bill appropriated funds to initiate construction of the Jones Bluff Lock and Dam, thereby assuring navigation from Mobile to Montgomery. A traffic survey of the Coosa River is in the process of being completed to determine the economic feasibility of improving the waterway for navigation from Montgomery to Gadsden, Alabama and Rome, Georgia, to be accomplished by the U.S. Army Corps of Engineers.

The Alabama-Coosa River development, as planned and underway, will ultimately provide a channel approximately 600 miles in length from Rome, Georgia, to Mobile, Alabama. Commerce then will have access to the entire basin through the Port of Mobile and the Gulf of Mexico intracoastal waterway which connects with eastern and mid-continent inland waterways. The establishment of navigation on the rivers will open markets, both domestic and foreign, to Alabama, Georgia, and a large portion of the balance of the Southeastern region.

The Alabama-Coosa River Basin has been labeled "an industrial fairyland". The availability of an abundance of water for navigation and industrial uses, together with the large volume of available hydroelectric power and the numerous prime industrial sites existing in the basin, will be the key to rapid growth of the economy of the area.

A study by the Alabama Power Company in 1957 of the eleven counties adjacent to the Coosa River in Alabama concluded that, within

a period of twenty years following the comprehensive development of the Alabama-Coosa River, existing plants would add more than \$113 million dollars in capital investment. This estimate proved to be conservative inasmuch as existing plants within the eleven counties, all of which lie within the Appalachian Region, have since 1963, invested or are now committed to invest an additional \$140.8 million dollars. New industries in the area have or are in the process of investing over \$75.5 million dollars.

The Alabama-Coosa River System is considered the greatest under-developed natural resource in the Southeastern region. The State of Alabama is convinced that the benefits to be derived from comprehensive development of the river system will exceed the conservative estimates of the Corps of Engineers, and will provide a great economic boost to the Southeastern Appalachian area.

30. Tennessee-Tombigbee Waterway

The upper reaches of the proposed Tennessee-Tombigbee Waterway traverse the northern part of Appalachia Alabama. Development of this waterway will have a favorable economic impact upon the area as a result of an increase in river traffic. Alabama supports and encourages early completion of advanced engineering work and the eventual accomplishment of the ultimate objective.

31. Low Flow Augmentation

Impoundment reservoirs to provide low-flow augmentation and attendant flood control are urgently needed on the Cahaba River and on the Locust and Mulberry Forks of the Black Warrior River. The completion of these storage facilities will enhance the economy of the basins by providing a guaranteed base flow for navigation by an increase in surface-water supply for municipal and industrial purposes, and by assurance of added flood relief in times of high surface runoff. The impoundment basins are so urgently needed that local groups have been organized in the metropolitan Birmingham area to assist in planning and promoting the development of these projects.

32. Recreation

Because of the abundance of water in Appalachia Alabama, considerable interest is being displayed at the local and regional levels to increase water oriented recreational development. A statewide Outdoor Recreation Plan is being prepared which will fully discuss all recreational projects now contemplated. Status of four of these is as follows:

a. The City of Scottsboro Park and Recreation Board has prepared a development plan for a multi-purpose recreation project on

Guntersville Lake. It is estimated this project will cost about \$4.5 million dollars. Facilities will eventually include transient lodging accommodations, a professional type golf course, a swimming complex, and a marina and cultural entertainment center. Operations will require 45 permanent and 55 seasonal employees.

b. St. Clair County officials have expressed an interest in several large scale multi-recreation developments on the shores of Logan-Martin Lake.

c. The water resources of the Cahaba River basin are virtually undeveloped with the exception of a small lake on the boundaries of Jefferson and Shelby Counties which is being used to supply part of the human water uses of the City of Birmingham - the lake has a small recreational use. The development of the Cahaba River and its tributaries appears to lend itself to use as a recreation area. This is suggested because the topography of the basin in West Shelby County and in Bibb County, north of Centreville is such that the river course is very rugged and precipitous. If the low water flows during the months of August, September, October, and November could be augmented by water releases from reservoirs on the upper tributaries, the Cahaba River area would be a very attractive and unusual recreation source close to four of the larger population concentrations of the State - Birmingham, Montgomery, Tuscaloosa, and Selma.

33. Water Supply and Related Projects:

A number of projects in Appalachia Alabama are in various stages of development. Some are as far advanced as the preliminary planning stage. Others should be considered to be contemplated. The group includes projects for municipal and industrial supply, recreation, power, flood control and navigation. Regardless of the primary need, each project will be planned for development on the multi-purpose concept. The following are typical and are shown on Figure 4:

Buttahatchee Creek: Water supply for the City of Hamilton, flood control and possible extension of navigation from the Tombigbee River to the vicinity of Hamilton in conjunction with the Tennessee-Tombigbee Waterway development.

Bear Creek Watershed: Improved land utilization to coincide with the completion of the four TVA dams and reservoirs that will create this watershed.

Big Wills Creek Drainage Basin: Flood control information is needed due to the increased urbanization of the Gadsden area.

Impoundment on the North River: Water supply for the Town of Berry in Fayette County and recreation facilities.

Sayre Dam: Potential municipal water supply, hydro-electric power and low flow augmentation.

Hatchet Creek: An outstanding potential site for a pumped storage hydro-electric facility.

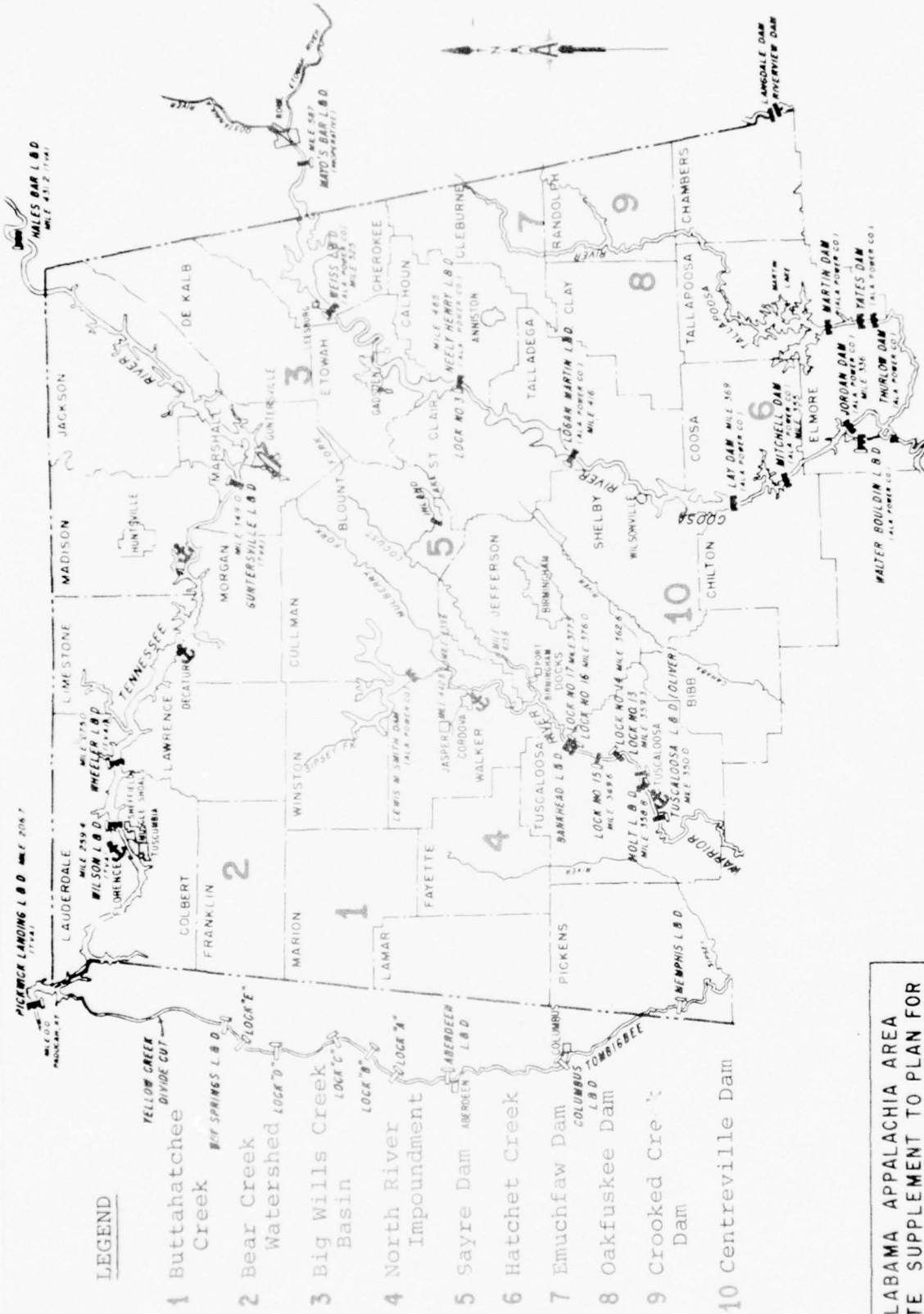
Emuchfaw Dam: Potential hydro-electric power and recreation.

Oakfuskee Dam: Potential hydro-electric power, flood control and recreation.

Crooked Creek Dam: Determined economically feasible by the Corps of Engineers; being considered for construction by Alabama Power Company.

Centreville Dam: Potential hydro-electric power, flood control and recreation.

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PROPOSED AND CONTEMPLATED PROJECTS

FIGURE 4

ALABAMA APPALACHIA AREA
STATE SUPPLEMENT TO PLAN FOR
DEVELOPMENT OF WATER RESOURCES
IN APPALACHIA

STATE PLANNING AND INDUSTRIAL
DEVELOPMENT BOARD
JUNE 1968

V-21 -A

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 2
GEORGIA WATER SUPPLEMENT

Prepared by
The Georgia Water Resources Center

1968

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 2
GEORGIA WATER SUPPLEMENT

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SECTION I - INTRODUCTION

1. The Water Development Coordinating Committee for Appalachia has requested that each participating state file a supplement to the U.S. Army Corps of Engineers' sub-region reports. These supplements provide an exercise in "creative federalism" by affording the States an opportunity for decision-making in a nationally sponsored regional program. The content of the supplement is left to the discretion of the State according to "its appraisal of the critical water resource problems within the State that it considers crucial from a development standpoint." 1/
2. Water resource problems can be roughly divided into four categories:
 - a. quantity,
 - b. quality,
 - c. destructiveness, and
 - d. management.

Many projects are underway in Georgia concerning the first three topics, but not much has been done about water resources management.

Authority governing the protection, conservation, development and use of water and other resources in Georgia is fragmented among the departments, agencies, and other entities of the State. Thus, the responsibility for water management functions in Georgia may be appropriately characterized as decentralized. All State agencies which deal with water management do so within a limited field of interest. 2/

3. In the past three State legislative sessions bills have been introduced (but not passed) to improve this situation by establishing a policy-making agency which would coordinate all related activities.

Since Georgia is working toward this end, it is hoped that no deep commitments in policy-making on water resources will be made before such a bill passes or before the State has some other administrative means of making clear its preferences and goals.

The current state of affairs apparently will not produce any projects detrimental to Georgia's long-range interests, but there is the possibility

1/Appalachian Regional Commission, Annual Report: 1967, p. 70.

2/George Roy Elmore, Jr., Georgia Law, Policies and Programs Pertaining to Water and Related Land Resources, (Water Resources Center report, 1967), p. 59.--see part VI.

that presently uncoordinated projects may eventually prove wasteful of time, money, and resources. Consideration of statewide plans now being prepared could reduce that hazard.

Therefore, this supplement aims at pointing out the magnitude of the water resources issue, the ramifications of current projects, and the advantages of more direct state involvement.

SECTION II - THE PROBLEMS

1. Water, a commodity so vital yet so easily misused, cannot be fairly distributed or safely utilized except under the broadest jurisdictions politically possible. There can be no local guarantee of local quantity, quality, or control without State or regional supervision, and those residing down-river must rely on the wisdom of those first using water--a dependency too easily ignored or abused.

2. Nature's bounty is not unlimited even though Georgia is currently blessed with an adequate supply of water. There will come a day when population and economic growth will necessitate careful distribution of water. Long strides have been taken in this direction already, but much remains to be done. To insure that every person and every usage gets a fair share, there must be coordination and cooperation supervised by statewide authority.

The use of water for present purposes will probably increase; new uses presumably will be found. Therefore, some hedge against future demands, priorities and controls must be adopted to prevent usurpation and control contamination of this public resource.

3. Nature's ability to unleash floods or cause droughts is not predictable, but these calamities have occurred often enough that likely trouble spots have been identified and adequate precautions have been prescribed.

4. Water Resource needs must be projected, priorities must be assigned, and controls must be instituted before irreparable harm or loss occurs. The quality and quantity of water are not inexhaustible, and the demands for them must be evaluated, anticipated, and provided for. The nature of the resource does not permit indefinite and indiscriminate usage. Without long-range comprehensive planning, present programs will reach points of conflict which will not be readily resolved.

Several state, federal, and private agencies responsible for water resource planning are now working under the coordination of the State Planning Bureau on a guide for preparing a comprehensive statewide plan.

5. Water resources development entails not merely controls over quantity and quality, but also consideration for nearby land uses. A reservoir

usable for boating and swimming will not be utilized fully if safe and easy access thereto is lacking. Failure to get the most of potentials is as much a waste as excessive pollution. Shoreline development, facilities provision, police control, etc., are in this instance requisite adjuncts to the prime purpose of water supply.

Due consideration should be given to developments in areas outside of Appalachia which might have an impact on this region. Heavy industrial and population growth in Atlanta and Athens may make heavy demands on Appalachia's water resources directly or indirectly.

6. As matters now stand there is not clearcut authority over water management. The most comprehensive management of water resources would be on a continental basis, but the world system of national competition makes this approach unlikely, and the job is perhaps too large and too expensive for a central agency to cope with on a nationwide basis. The next level of administration best suited to handling the subject is the state (or states in cooperation as in the Appalachian program). Any lower level of government, such as the county or minor civil division, does not have the scope of authority, the breadth of view, nor the availability of talent to deal with broader aspects. Local units are hard-pressed to meet their particular problems and they do not have the authority, the means, nor the desire (ordinarily) to serve the needs or meet the goals of areas outside their political boundaries.

SECTION III - THE CURRENT STATUS

1. The following partial inventory of government projects involving the water resources of Georgia's Appalachia reveals a high degree of local-federal commitment without a corresponding level of state participation.

a. Economic Development Administration. Six project or studies:

Alto (Habersham County)--city water system
Hiawassee (Towns County)--feasibility study for recreation park
Coosa Valley Area Planning and Development Commission (APDC)--
exploration of mineral resources
Georgia Mountains APDC--planning grant
Northeast Georgia APDC--planning grant
Lake Lanier Islands Development Authority--feasibility study of
recreational development.

b. Soil Conservation Service. Forty-six watershed improvement projects under varying stages of investigation or development. Five have been completed.

Hightower Creek (Tennessee River Basin)
Hazel Creek (Chattahoochee River Basin)

Santee Creek (Chattahoochee River Basin)
North Fork, Broad River (Savannah River Basin)
Beaverdam Creek (Savannah River Basin)
Grove River (Savannah River Basin)

c. Housing and Urban Development. Grants to cities and counties for planning assistance and water and sewage systems (listing not currently available).

d. Farmer's Home Administration. Study grants for water and sewer projects in communities of less than 5,500 population. Every qualifying town in Georgia's Appalachia has been covered under this program.

e. United States Army Corps of Engineers. Several dams, multi-purpose reservoirs, and navigational aids have been studied and/or built:

Completed:

Allatoona Dam (Coosa River Basin)
Buford Dam (Lake Sidney Lanier--Chattahoochee River Basin)
Hartwell Dam and Reservoir (Savannah River Basin)

Underway:

Carter's Dam (Coosa River Basin)
West Point Dam (Chattahoochee River Basin)
Alabama-Coosa River navigation project

Proposed:

Curry Creek Reservoir (Altamaha River Basin)
Dalton Reservoir (Coosa River Basin)

f. Appalachian Regional Commission. The construction or improvement of fifteen sewage treatment plants has been funded over the past three years: ten in the Coosa River Basin, two in the Tennessee River Basin, two in the Tallapoosa River Basin, and one in the Chattahoochee River Basin.

g. United States Fish and Wildlife Service. Maintains two national fish hatcheries: the Chattahoochee Forest and the Cohutta.

h. United States Forest Service. Maintains water sites in the 3/4-million-acre Chattahoochee National Forest.

i. Tennessee Valley Authority. Maintains three reservoirs in the Tennessee River Basin: Nottley Lake, Chatuge Lake, and Blue Ridge Lake.

2. Most of the following State agencies are involved in a marginal role in many of the above projects. Little or no project funding is carried on by the state.

Department of Mines, Mining and Geology
Department of State Parks

Game and Fish Department
Soil and Water Conservation Committee
Water Quality Control Board
Water Supply Service

3. Many of the projects mentioned might prove more effective if more regard could be given to their impact on each other and on related activities. No water-resource-related project should be undertaken without consultation with potentially concerned agencies, and water site developers should keep themselves informed of other plans or developments which may have an impact on their project.
4. So far, local and federal authorities have been managing Georgia's water sources with only token involvement by State agencies, but in the future the State by virtue of its administrative position may assume a more active role. For example, the State's having a broader perspective than any of its member localities might enable it to prevent potentially conflicting or duplicating projects.

SECTION IV - CONCLUSION

1. The foregoing chapters have shown that there is considerable effort being expended to improve and control Georgia's water resources. But those same chapters raise the question: To what degree could lack of statewide coordination of all this effort be diluting the final results, due to conflicts, duplications, lack of statewide priorities, etc.?
2. Studies are underway in Georgia now to determine to what degree additional coordination may be needed at the state level, and to determine the best coordinative approaches for maximizing for the state as a whole the benefits from water resources activities.
3. The two most obvious coordinative approaches are the formal and the informal. The creation of policy-making and/or coordinating agencies are examples of the formal approach. Some steps have already been taken in this direction.
4. In the 1968 State Legislative session an attempt was made to pass a "Water Resource Planning and Coordinating" Bill (H. B. 397). Significantly, its three sponsors represented 5 counties (Dade, Walker, Whitfield, Murray, and Habersham), which lie within Georgia's Appalachian Region. This bill proposed as Georgia's policy:

To encourage, promote and assist the conservation, development and utilization of water and related resources of the State on a comprehensive and coordinated basis. To achieve this end, the government

of the State shall assume responsibility for water resource planning, policy-making and coordination, and in so doing, shall take into account the total welfare, economy and growth of the State.

With such authority, the commission and the department as proposed in the bill could determine broad policies for the State as a whole. Some of the more specific functions which could be undertaken are:

- a. inventory in detail the present situation,
- b. check and correlate existing plans and proposals from all sources,
- c. prepare a comprehensive plan for water resource throughout the state,
- d. determine criteria of values such as preserving wild rivers versus conversion of them into barge canals,
- e. establish priorities of need according to areas and uses,
- f. devise systems for obtaining maximum benefits from any project through coordination of agency activities, and
- g. request the state to appropriate funds to match federal grants under PL 660 as already authorized by the Georgia Water Quality Control Act of 1964.

Some of the parties who are concerned with water resources in Georgia are, then, seriously considering the advantages of a formal approach to policy-setting and coordination.

5. The informal coordinative approach is simply a matter of the various agencies involved in water resources devising a set of mutually-agreeable and compatible guidelines to serve as a voluntary coordinative influence in their planning. For example, a joint meeting might select recreation or some other facet for special emphasis for development of a specific region. Such a choice would offer a common goal which would make inter-agency cooperation easier. It would also be of a kind not difficult to change at a later date, and its effects would not prevent conversion into some other purpose. For example, all agencies could give recreation special attention, and any improvements or installations for this purpose would not hinder a subsequent changeover to industrialization as the region's goal.

6. Since development corridors with their particular growth areas as communities have been identified in Georgia's 1968 Appalachia Investment Plan, special attention should be given to these parts of the region. Participating agencies could consult one another as to steps to be taken concerning water resources within and bordering these corridors.

Whether or not such steps are taken in the near future, the local, state and federal offices currently working on Appalachia's water resources may find useful Georgia's Outdoor Recreation Plan, Georgia's 1968 Appalachia Investment Plan, and the State Water Resources Planning Program which will be available shortly.

7. Since Georgia's Appalachia is doubly valuable as a relatively unspoiled scenic area and as the headwaters of several of the State's river basins, some aspects of water resources development in that area should not be accorded priority on a strictly cost-benefit analysis. Some priceless values such as scenic beauty can best be preserved by the least modification (such as recreation).

8. Most of the projects now underway are of a limited scale and not likely to adversely affect any future consideration; but some proposals are being offered whose ramifications demand statewide acceptance. Since Georgia is moving closer toward clarifying its viewpoint and establishing the policy-making machinery needed to convey that viewpoint, great caution is recommended in initiating any major project until an approach has been established to guide that project for maximum statewide benefits.

9. Coordination of current projects and proposals is the immediate need; short and long-term goals must be identified and correlated soon. In both instances the State is the most appropriate authority to manage its water resources, and Georgia is aware of this responsibility.

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 3
KENTUCKY WATER SUPPLEMENT

Prepared by
The Division of Water, Department of Natural Resources
in coordination with
The Kentucky Area Development Office
Office of the Governor

December 1967

CHAPTER 3
KENTUCKY WATER SUPPLEMENT

PART I

Kentucky Revised Statutes 151.110
Water Resources Policy

The conservation, development, and proper use of the water resources of the Commonwealth of Kentucky has become of vital importance as a result of population expansion and concentration, industrial growth, technological advances, and an ever increasing demand on water for varied industrial, municipal and recreational uses. It is recognized by the General Assembly that excessive rainfall during certain seasons of the year causes damages from overflowing streams. However, prolonged droughts at other seasons curtail industrial, municipal, agricultural and recreational uses of water and seriously threaten the continued growth and economic well-being of the Commonwealth. The advancement of the safety, happiness and welfare of the people and the protection of property require that the power inherent in the people be utilized to promote and to regulate the conservation, development and most beneficial use of the water resources. It is hereby declared that the general welfare requires that the water resources of the Commonwealth be put to the beneficial use to the fullest extent of which they are capable, that the waste or nonbeneficial use of water be prevented, and that the conservation and beneficial use of water be exercised in the interest of the people. Therefore, it is declared the policy of the Commonwealth to actively encourage and to provide financial, technical, or other support for projects that will control and store our water resources in order that the continued growth and development of the Commonwealth might be assured. To that end, it is declared to be the purpose of KRS Chapters 146, 149, 151, 262, and 350.029 and 433.750 to 433.757 for the Commonwealth to permit, regulate, and participate in the construction or financing of facilities to store surplus surface water for future use; to conserve and develop the ground water resources of the Commonwealth; to protect the rights of all persons equitably and reasonably interested in the use and availability of water; to prohibit the pollution of water resources and to maintain the normal flow of all streams so that the proper quantity and quality of water will be available at all times to the people of the Commonwealth; to provide for the adequate disposition of water among the people of the Commonwealth entitled to its use during severe droughts or times of emergency; to prevent harmful overflows and flooding; to regulate the construction, maintenance and operation of all dams and other barriers of streams; to prevent the obstruction of streams and floodways by the dumping of substances therein; to keep accurate records on the amount of water withdrawal from streams and watercourses and reasonably regulate the amount of withdrawal of public water; and to engage in other activities as may be necessary to conserve and develop the water resources of the Commonwealth of Kentucky.

Foreword

Appalachian Kentucky, with its abundant rainfall and its often flooded narrow valleys, can only be developed through sound water resources planning. Control of runoff and storage of rainfall will allow a higher level of utilization of the scarce flat bottomlands, while at the same time providing abundant water supplies for municipal, industrial and recreational uses.

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
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*/ This part was prepared for the Appalachian Regional Commission as part of the Commonwealth of Kentucky Investment Plan. Consequently, the Appendices to this part are not reproduced as a part of the Commonwealth Supplement to the Appalachian Water Resources Report.

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I. INTRODUCTION

Section 206 of the Appalachian Regional Development Act of 1964 called for the preparation of a comprehensive plan for the development and efficient utilization of the water and related land resources of the Appalachian Region. To supplement their work, the Office of Appalachian Studies of the Corps of Engineers requested Kentucky to prepare a supplement to the subregional reports. This Kentucky Supplement:

- * Describes the State's plan for the development of the Region.
- * Proposes water planning policy modification needed to maximize the impact of water resources planning on the development of the region.
- * Outlines current state-supported water resources programs related to Appalachian Kentucky development.
- * Describes current water resources planning efforts relating to Appalachian Kentucky development.

Recent History of Water Resources Planning in Kentucky

Prior to 1965, comprehensive water resources planning and development by the State of Kentucky was virtually nonexistent. The state's primary contribution to planning consisted of the Small Lakes Program, which will be discussed in the second part of this Supplement, and internal coordination of flood control projects developed in Kentucky by the Corps of Engineers. The staff of the Division of Flood Control and Water Resources Development in 1964 consisted of a director, one engineer, and one secretary. It is estimated that not more than \$5,800 was spent on planning activities of any sort during FY 1965.

Through the efforts of the Commissioner of Natural Resources, the budget was increased in 1966 and an additional engineer employed. With the assistance of the Office of the Attorney General, the staff drew up proposed legislation which would greatly strengthen the legal status of water resources development in Kentucky. The proposed legislation was passed as House Bill 260, and was incorporated into Chapter 151 of the Kentucky Revised Statutes. The bill established the new Division of Water in the Department of Natural Resources and also the Water Resources Authority of Kentucky. The Division of Water was designated the operating arm of the Authority, and the Director of the Division of Water was designated the Executive Director of the Authority. The Authority was given broad fiscal and regulatory powers by the statutes.

An extensive search was conducted to find a qualified Director for the new Division of Water, to succeed the retiring Director of the Division of Flood Control and Water Resources Development. A Colonel of the

Corps of Engineers, a professional engineer with extensive water-related experience, was selected as the new Director. At the same time, the budget of the Division of Water was doubled.

Thus, the beginning of Fiscal Year 1967 found the State of Kentucky prepared, for the first time, to make significant advances toward comprehensive planning for the development of water and related land resources.

The increased budget enabled the Division of Water to expand both its staff and facilities, thereby accomplishing the first and most vital step toward progress in planning. The implementation of the 1966 Water Law was begun with the establishment of construction and water withdrawal permit systems. Engineering standards for the design and construction of earth dams were developed and published. To further the development of a skilled engineering staff, a training program was established in cooperation with the University of Kentucky. An inventory of the State's available water resources was begun. The Division embarked upon a broad program of cooperation and coordination with other Kentucky agencies, as well as with those of the other states and the federal government.

Under the leadership of the new Director, and with the support of the Governor and the Commissioner of Natural Resources, the Division staff was increased as rapidly as possible. The Division staff presently consists of 13 full-time and 3 part-time employees. This staff was augmented by 14 full-time students during the summer months.

In recognition of the many complexities involved in the development of a comprehensive planning procedure, the Division of Water employed Spindletop Research, Inc., a non-profit research organization, to develop a computerized framework for the comprehensive planning system.

Scope of this Report

The Kentucky Supplement to the Appalachian Water Resources Sub-Regional Reports for Sub-regions G, H and I are consolidated into a single document and submitted as an Appendix to Sub-regional Report H.

This Report, in Part 2, contains a discussion of proposed modifications in Federal Water Planning Policy and suggests that water resource planning encompass all foreseeable demands for water supply, including municipal, industrial, and agricultural use in the "distant" future of 50-100 years. Part 3 provides information concerning current, Commonwealth-supported, water resource programs. Part 4 is a brief discussion of the status of a computerized water management information system which Kentucky is developing as an aid to improving the water resources planning process.

Part 5 consists of the Development Plan for Appalachian Kentucky and constitutes the main body of this report. In Kentucky, the multi-county development areas as designated by Executive Order of the Governor form the basic building blocks for the development program. Each of these multi-county development areas have organized functioning development councils to guide these development activities. The area development plans summarized in the appendices and the development strategies described thereon provide the focus for their development efforts. Because these multi-county groupings are so thoroughly integrated into the development process in Kentucky, it was not possible to break out special reports for Corps of Engineers' Sub-regions G, H, and I.

In addition, the first five sections of Part 5 contain policy statements and program information which relate to Appalachian Kentucky as a whole. These statements and this information provide a frame of reference for understanding the development process as it is perceived as functioning in Kentucky.

Part 5 was prepared by the Area Development Office, Commonwealth of Kentucky, in conjunction with overall development programming activities financed in part by grants from the Appalachian Regional Commission and the U.S. Department of Housing and Urban Development. Spindle-top Research provided staff assistance in the compilation and preparation of this material.

II. PROPOSED MODIFICATIONS IN FEDERAL WATER PLANNING POLICY

Introduction

The Commonwealth of Kentucky has become increasingly concerned with what it considers a serious deficiency in current federal water resource planning policy.

The deficiency lies in the definition of "federal interest," which currently maintains that the only water needs of sufficient importance to merit federal financing and participation are: flood control, navigation, pollution abatement, and, to a lesser degree, recreation. The provision of water supplies for human consumption, industrial growth, and crop irrigation (outside of the Reclamation States) are secondary considerations - which must be largely financed at local cost.

To assure that all water resource plans, particularly reservoirs constructed in the future, are designed to provide sufficient water to meet all foreseeable demands, emphasis must be given to the development of water supplies for municipal, industrial and agricultural uses. In the development of reservoir sites, the primary concern must be with the "distant" future of 50-100 years, and not the "immediate" future of 10-20 years.

The 1966 National Governors' Conference expressed concern that the full dimensions of water needs were not being recognized. The states unanimously adopted a resolution on the long-term needs for water and the importance of comprehensive federal plans. The resolution stated:

"Since dam and reservoir sites are a natural resource, each should be developed to its full potential to meet present and future needs as a multi-purpose structure. Therefore, the Congress should revise and broaden its policy relating to the conservation and wise use of the nation's water supply so that water storage to meet expanding municipal, industrial and recreational needs and other future beneficial uses is established as a primary benefit with the same priority as flood control, navigation, pollution abatement, and low-flow augmentation in establishing project justification, and federal funds should be appropriated in sufficient amounts to provide adequate water storage capacity for these purposes."

The Commonwealth of Kentucky wishes to reaffirm its support of the above resolution. Kentucky further proposes that the Water Resources Development Plan for Appalachia provides a suitable and timely vehicle for the initial implementation of this proposed policy.

General Background

The generally accepted national planning factor for determining water requirements for the year 2000 is that the demand for water will increase five-fold while the population doubles. Kentucky does not argue with this factor - but the state does question its somewhat uniform use across the nation without considering the actual geographic availability of water.

Many geographic areas of the nation currently have water supply problems, or their future available water can be seriously limited due to inadequate rainfall, the non-availability of suitable reservoir sites, or the great cost and legal restraints on large scale water diversions. Therefore, it is likely that large areas of the country may not be economically able to absorb their pro-rata share of the doubled national population.

There are only three major areas in the United States with largely underdeveloped native water resources where a doubled, tripled, and even quadrupled population can economically be supported, and then only if we have the foresight to plan and construct the necessary water resources structures. These areas are the Pacific Northwest, Appalachia, and the Old South (including the Arkansas River Basin).

New industry and increased population must locate where water is

economically available to meet their demands. It would be short-sighted to build reservoirs and other permanent improvements in these water-rich areas to less than their maximum potential, since construction frequently preempts future development of sites.

The entire Appalachian Region from New York to Mississippi is a water-rich area with literally hundreds of good reservoir sites of great potential. Unfortunately, however, the low population and the subsistence economy result in a very limited tax base which precludes local financing to satisfy existing federal criteria pertaining to purchase of storage for long-range future demands for water.

As the plans for the James River, the Potomac River, the Susquehanna River and the New York Water Supply Study are completed, and the long-range problems of the Ohio Valley are better understood, the role of Appalachia as a watershed will be more fully appreciated. It will become increasingly evident that this area must occupy a key position in the developing water economy of the Eastern United States. This fact is not now widely recognized.

The construction of reservoirs adequate to meet long-range needs in Appalachia would permit and encourage maximum industrial development and growth in the area. It would also provide resources for inter-basin transfers within the region and establish a capability for exporting urgently needed water to other areas peripheral to Appalachia.

Such a policy would lead to the most effective use of scarce reservoir sites and the building of systems to their maximum potential.

Major Problem Areas

Four major problem areas for consideration are discussed separately with proposed recommendations.

1. Water Supply for Municipal and Industrial Uses. Generally speaking, the whole Appalachian Area has suffered from low-flows during the dry season and from a lack of sufficient flood-free land to permit population and industrial expansion.

Reservoirs to be proposed in the Water Resources Development Plan for Appalachia, those under study but not yet proposed, and those now under preliminary consideration will provide an appreciable measure of flood control. This, in turn, will release periodically flooded flat lands for population and industrial expansion, and also provide a year-round availability of adequate water.

However, the struggling Appalachian communities are financially incapable of meeting even their short-term water supply needs under the

dollar requirements of present water planning criteria. This situation will grow worse and will reach a crisis before the end of the expansion period projected by the Appalachian Plan.

Since this region is naturally water-plentiful, consideration must be given to the immediate development of a potential water supply source sufficiently large not only to meet the projected 100-year demands for the region, but also to provide for the export of water to adjacent water-short areas.

To this end, the Commonwealth of Kentucky recommends the extension of the Royalton-Salyersville type of comprehensive planning (at federal expense) to all proposed reservoir sites and vicinities, and the adoption of the following policy regarding the provision of water supply storage in all federal reservoirs in the region:

"It shall be the will of the Congress that all reservoir sites currently being studied and to be studied in the future will include, as a primary benefit, federally funded, the municipal and industrial water supply needs for the affected area (and for export) for the foreseeable future (50-100 years)."

2. Water Supply for Irrigation and Agricultural Purposes. Projections show that the world food problem can be expected to become more critical rather than to improve. The burden of this problem will fall primarily on the one nation with the means to cope with it: The United States. This is a problem of the gravest dimensions, and one which must be met realistically.

The solution to the problem will call for both increased crop acreage and maximum crop yields. The most logical means of obtaining these is through wider use of irrigation. While the plains states will provide the great bulk of grain production, the area east of the Mississippi must do its part in corn, vegetable and dairy production. Corn and vegetables require considerable irrigation if maximum yields are to be obtained.

The water necessary for irrigation will not be available unless we act now to provide it. In Appalachia, many of the first-class reservoir sites are already occupied, with reservoir storage earmarked for flood control, recreation and pollution abatement. This water cannot be diverted to irrigation, as it is essential to the region's economy that it be used for its designated purposes.

There is at present no provision for federal funding of reservoir storage to meet agricultural needs in the states east of the Mississippi. Under the Watershed Protection and Flood Prevention Act, as amended (PL 83-566), irrigation storage may be included in small watershed projects, but only on a wholly reimbursable basis.

The former Governor of Kentucky (Governor Breathitt) was in continuous correspondence with the U.S. Secretary of Agriculture, voicing his concern over federal neglect of future agricultural water needs in planning for multi-purpose federal reservoir projects. There seems to be little direct concern at the federal level over future (long-range) irrigation requirements in the states east of the Mississippi. The correspondence indicates that federal response to any proposed changes in current planning policy is likely to be extremely slow in coming. Unfortunately, the Appalachian Plan cannot afford to wait, as the prime reservoir sites are disappearing rapidly.

Kentucky, eager to evaluate the actual economic potential of irrigation in the eastern states, undertook an irrigation feasibility study for an area lying along the Rolling Fork River, a tributary of the Salt River. The area studied lies downstream from the proposed Howardstown Reservoir, a multi-purpose structure. The reservoir would make some 30,000 downstream acres essentially flood-free and suitable for full agricultural use.

A study performed by agricultural engineers and economists at the University of Kentucky determined:

- * That approximately 15,000 of the 30,000 acres had the proper soil classification and lay close enough to the river to make irrigation technically feasible.

- * That the majority of the 15,000 acres were planted in corn - which was used as the base crop for the study.

- * That, using supplemental irrigation water, nine years in ten, and assuming proper fertilization, net average annual irrigation benefits of \$600,000 would accrue (\$40 per acre).

This study indicates that irrigation in this area has a definite economic potential, and probably would be economically feasible in many of the valleys of the Appalachian Region. It is believed to be in the national interest that the Corps of Engineers and the Department of Agriculture undertake detailed irrigation potential studies for the areas which are to be served by future federal multi-purpose reservoir projects and Soil Conservation Service structures in the eastern states.

In view of the foregoing discussion, it is proposed that the following policy be adopted by the Congress of the United States:

"It shall be the will of the Congress that all reservoir projects of the Corps of Engineers and Soil Conservation Service currently being studied and to be studied in the future will include, as a primary benefit, federally funded, the agricultural water needs for the affected area for the foreseeable future (50-100 years)."

3. Pollution Abatement. The Commonwealth of Kentucky fears that present criteria precluded the Appalachian Plan's giving adequate consideration to the full requirements for low-flow augmentation and pollution abatement water. In support of this contention, the following points are discussed:

* Population Growth in the Area. It is believed that the lack of available water in certain other areas of the United States, coupled with the enhanced growth in Appalachia induced by the plan, will result in a population increase there greater than that projected by the OBE. This will in turn create an increased pollution abatement problem not now adequately considered.

* Industrial Growth in the Area. Water-rich areas of the nation will attract industry at a much faster rate than other sections. As water resources development occurs in Appalachia, and other improvements such as roads become an actuality, industrial location in the area may well exceed projected levels. Thus, requirements for additional pollution abatement water will be generated irrespective of the levels of treatment achieved. In a like manner, the availability of large quantities of such water will inevitably attract industry as water-scarce areas deplete their surplus pollution abatement capability.

* Economics - State-of-the-Art. Given the state of water pollution abatement technology, there is a point at which the cost of preventing pollution becomes prohibitive. This point exists in both municipal and industrial pollution control. In years to come, many communities in Appalachia will probably lack the tax base necessary to finance the construction of treatment facilities adequate to meet desired standards. In view of the anticipated expansion of the region, and a very real cost constraint under the present state-of-the-art, reexamination of the problem may indicate that it would be more prudent, and less costly in the long run, to build additional pollution abatement supply into planned reservoirs than to rely entirely on waste treatment processes.

These three points become more important when viewed in the framework of the minimum reservoir structure life of 100 years. By that time, it is firmly believed that needs for low-flow augmentation and pollution abatement water will far exceed the capacities being considered as adequate for this plan.

The above discussions lead to the recommendation by Kentucky that the Office of Appalachian Studies and the Federal Water Pollution Control Administration give further study to the need for storage of additional pollution abatement water.

4. Reservation of Reservoir Sites. Throughout the United States, good reservoir sites have largely been preempted, either by population

growth and industrial expansion, or by the construction of reservoirs themselves. This situation does not yet exist in the Appalachian Region. Some desirable sites are uneconomical under present criteria due to existing developments, but many excellent reservoir sites remain available.

As the Appalachian Regional Plan is implemented and the projected industrial and population expansion becomes a reality, encroachment by people, factories, and service facilities will progressively restrict the feasible water resources development.

Efforts should be undertaken to identify and to reserve desirable reservoir sites for subsequent development. This apparently simple endeavor is in fact most difficult to accomplish, since zoning is historically a very sensitive local prerogative. Local government zoning (city and county) has traditionally been greatly influenced by immediate political interests. Thus, to achieve adequate reservoir site zoning at the local level in Appalachia may prove impossible.

Inter-basin, inter-regional (and even international) transfers of water supplies are now an actuality. These programs and projects now contribute in some measure to the total well-being of not only all people in the water system (from headwaters to the ocean), but also to the prosperity and welfare of all sections of the United States. The time has come for executive and legislative recognition of the fact that regional water resources planning and its resultant structures are of national significance. In order that the water resource requirements of the entire nation may be met in the distant future (100 years), the federal government must identify and reserve potential prime development sites. To do so, it must be prepared to accomplish zoning of these sites under federal prerogatives, to include acquiring restrictive easements, options, or outright purchases at federal expense.

It is the recommendation of the Commonwealth of Kentucky that the Office of Appalachian Studies, or the Appalachian Regional Commission, conduct a special study of this problem and make definitive recommendations to the Appalachian States and to the Congress.

III. CURRENT COMMONWEALTH-SUPPORTED WATER RESOURCES PROGRAMS

As a result of the 1966 Kentucky Revised Statutes Relating to Water, the Division of Water acts in a dual capacity as an element of the Department of Natural Resources and as the operating arm of the Water Resources Authority.

To carry out these dual responsibilities, various programs were initiated and are currently underway. Generally, these programs are presently of three types - jointly financed cooperative programs with

other water-oriented agencies; water planning and development programs financed by the Commonwealth; and regulatory programs as required by Kentucky law.

This part consists of a brief description of these ongoing programs, which are applicable to the whole of Kentucky.

Cooperative Water Resources Development Group

Under the guidance of the Director of the Division and with the enthusiastic support of all concerned, an informal water resources development group has been formulated in the Commonwealth.

This group includes all intrastate agencies involved in water or related land resources development, plus the regional federal agencies which participate in water development planning for the Commonwealth of Kentucky. This group meets one-half day each month for the common and cooperative exchange of their departmental activities in relation to water resources development.

PRINCIPAL PARTICIPATING AGENCIES

Kentucky Department of Health
Kentucky Department of Parks
Kentucky Department of Fish and Wildlife
Division of Fisheries

Kentucky Department of Natural Resources
Division of Forestry
Division of Reclamation
Division of Soil and Water Resources
Division of Water

Kentucky Area Development Office
Kentucky Geological Survey
Water Resources Research Institute (University of Kentucky)
Spindletop Research, Inc.
Federal Pollution Control Agency
National Park Service
U.S. Bureau of Outdoor Recreation
U.S. Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Geological Survey
U.S. Soil Conservation Service

Participation in Ohio River Basin Comprehensive Survey and Appalachian Water Development Coordinating Committee

Kentucky has considerably increased its participation as a member of the Water Development Coordinating Committee for Appalachia and as a member of the Ohio River Basin Comprehensive Survey.

Since May 1966, either the Director or Deputy Director of the Division (usually both) has attended and actively participated in every meeting of both organizations. In addition, the Director and Deputy Director served actively as working members of the Ohio Region (Chapter 12) National Assessment Task Force for the Water Resources Council.

The Director has attended approximately 12 national meetings of water-related associations and served as the co-chairman of the Committee on Flood Control and Low-Flow Augmentation of the 1967 National Rivers and Harbors Conference in Washington. The Director and Deputy Director made numerous speeches throughout Kentucky, and a few major speeches outside the Commonwealth, on water resources development. As a result of these actions, Kentucky is becoming recognized throughout the field of water resources development and is profiting considerably from these contacts.

Cooperative Program with the University of Kentucky

During 1967, the Division of Water and the Water Resources Institute of the University of Kentucky established a cooperative training program open to both graduate and undergraduate students in the field of Water Resources. This program was initiated with the following objectives:

- * To conduct basic and applied research on water related problems of importance to the Commonwealth of Kentucky.

- * To provide for the professional development and training of students in areas related to water.

- * To assist the State in the many problems which will arise as the State's development program expands.

This program was started in January 1967, carrying four student trainees on a part-time basis during the spring semester. The summer program was increased to fourteen full-time student trainees, many being graduate students in the field of Water Resources.

It is expected that this program will serve to provide the practical experience needed to further the professional development of these students.

From the success of the program thus far, it seems that the Division of Water will depend heavily upon such training in building adequate staff to maintain and expand planning in the field of Water Resources.

U.S. Geological Survey - Kentucky Five-Year Program in Surface and Ground Water Data Collections

Upon the recommendation of the Division of Water, the Kentucky Water Resources Authority, in its regular September 1966 meeting, voted to increase the Kentucky portion of the USGS Kentucky Ground and Surface Water Gaging Program as follows:

<u>Fiscal Year</u>	<u>Kentucky Budget Allocation</u>
1965	\$158,000
1966	158,000
1967	148,000
1968	276,500
1969	311,500
1970	338,500
1971	357,500
1972	380,000

This increase will permit the addition of seven new gaging stations a year, the more frequent operation of part-time stations, and increased ground-water investigations.

Water Resources Inventory

During FY 1967 the Division of Water initiated a project to inventory the available water resources of the Commonwealth. This inventory will provide data basic to the State's water resources planning effort.

The first step in this project is an inventory of all impoundments of significant size within the state. This inventory will include the size, type, storage capacity, etc., of each structure. This information will be incorporated into a basic data book which will contain pertinent information on all structures in the State. Such a data book will, from all indications, be of substantial benefit to several State and federal planning agencies. It is intended that this inventory be updated as water resources development progresses in order that maximum benefit may be derived from the data.

This project is being conducted by personnel of the Division of Water and the Water Resources Institute Training Program. Significant progress has been made on this project, but it is recognized that completion is several years away because of limited personnel during the scholastic year.

Small Lakes Program

The 1960 Kentucky Legislature authorized a two-million dollar fund

for the development of small lakes. A Lakes Development Committee, headed by the Governor and composed of interested Commissioners, was created to administer this fund. The first phase of this program ran from 1960 through 1965, resulting in the completion of 18 lakes ranging from 6 to 857 acres in surface area. All 18 lakes are primarily recreational facilities, but seven of the lakes serve additional purposes. Three provide municipal water supply, three provide storage for future water supply, and one provides limited flood control and low-flow augmentation. Of the 18 completed, nine were impounded by highway embankments and were designed by the Highway Department in conjunction with the Division of Water.

The second phase of the Small Lakes Program was initiated in late 1965 upon passage of an omnibus bond issue including one million dollars for this program, to be administered by the Kentucky Department of Natural Resources. As a result of this action, three more lakes have been approved and are in advanced planning or construction, three more are in advanced study, and dozens of potential sites have been examined and rejected because of project infeasibility.

The second phase is limiting consideration to highway embankment fills for reasons of economy. When preliminary studies indicate that a project is feasible, two designs are prepared - one for a normal highway embankment and drainage structure and another for a dam with the crest serving as the roadway. The Highway Department's participation is limited to the cost for the normal highway crossing. The Lakes Development Fund pays all the added costs of investigation, design and construction. The local sponsor (a city, county, water district, etc.) acquires and clears the reservoir site in addition to agreeing to provide maintenance and operation of the reservoir. The Highway Department maintains the dam.

The end result of this policy has been the construction of some very economical small lakes in strategic locations throughout the state.

Flood Plain Management

During FY 1967 and early FY 1968, Kentucky has progressed in its preparations to establish the State's portion of the coordinated federal/state/county/city responsibilities in complying with the Presidential Executive Order 11296, dated August 11, 1966, and in spirit with the Presidential Communication to the Congress entitled "A Unified National Program for Managing Flood Losses", dated August 10, 1966.

One Division of Water engineer was assigned to this project. This action resulted in the arrangement of a comprehensive briefing on the subject of flood plain management. The briefing was presented by Mr. Joseph I. Perrey, director of flood plain studies for the Corps of Engineers Division Office in Cincinnati. The briefing was attended by approximately 50 persons engaged in planning and zoning throughout the

Commonwealth. A second briefing, dealing with Kentucky's problem areas, was held in the Louisville District Office immediately after the close of the fiscal year. A program for additional briefings to all interested groups throughout the State has been planned.

Liaison has been established with the responsible individuals in the Corps of Engineers Offices having jurisdiction in Kentucky. Studies delineating flood-prone areas in Louisville and Jefferson Counties have been completed by the Corps of Engineers and will be utilized by the Division of Water. During the year, several flood plain construction problems have been examined and resolved by the Division of Water.

Publication of Standards and Criteria for Design and Construction of Earth Dams

The Division of Water, pursuant to authority contained in KRS 151.220 (part of the Water Resources Act of 1966) published Engineering Memorandum Number 1 during FY 1967, setting forth instructions, standards, procedures and limiting criteria for proportioning earth dams and associated spillways in Kentucky. This regulation was designed to insure that all structures be built in accordance with sound engineering principles.

Establishment of Permit Systems

Construction Permit System. Pursuant to the provisions of KRS 151.250 the Division of Water established in FY 1967 a permit system for the regulation of all physical construction in the floodways of the streams of the Commonwealth. In accordance with KRS 151.250 any proposed construction, reconstruction or other obstruction in the floodways of the State's streams must be reviewed by the Division of Water and a permit issued before such construction may commence. This regulation is intended to insure that all such construction be designed and built in accordance with sound engineering principles and that the people of the Commonwealth will not be damaged by the presence or structural failure of such obstructions.

As of December 1, 1967, several projects had been reviewed by the Division of Water and some 80 construction permits were issued.

Water Withdrawal Permit System. In accordance with KRS 151.140 of the Water Resources Act of 1966, the Division of Water established (effective June 16, 1966) a water withdrawal permit system covering all withdrawers of public water in Kentucky except farmers and industrial plants which return water to the source of withdrawal in substantially the same quantity and condition. To date, approximately 620 water withdrawal permits have been issued.

The data from the permits and permit applications are coded on automatic data processing cards and tape for instant recall and analysis. The computer program which performs the recall and analysis was developed by the Division of Water in conjunction with its University of Kentucky Cooperative Program.

Digital Computer Applications

The Division of Water has increased its capabilities through more intensive use of the digital computer. The computer greatly boosts the efficiency and flexibility of the Division, both in the solution of practical engineering problems and in the development of the water resources planning process.

During FY 1967, several programs were developed which aid the Division in making hydrologic and hydraulic investigations on both existing and proposed projects. These programs perform such tasks as the computation of water surface profiles in stream channels; the establishment of stage-discharge relationships for emergency spillways; and the analysis of streamflow records to ascertain various flow characteristics for specific streams. In addition, the Division is working closely with the Soil Conservation Service in order to incorporate programs developed by SCS into the Division's program library.

Several programs have also been developed to aid the Division in the planning process. These programs make water withdrawal and construction permit data readily available on a river basin, county, or permit number basis. Work was partially completed on the development of a program which will give a complete analysis of water use in Kentucky, providing detailed information on the quantity and quality of water required by the various categories of users in all parts of the state. Such an analysis of water use is essential as a basis for future decision making in wise water resources planning.

IV. SUMMARY OF THE KENTUCKY WATER MANAGEMENT INFORMATION SYSTEM

Introduction

The purpose of this summary is to describe, in general terms, Spindletop's development of a computerized information system which will serve as a principal tool for water management in Kentucky. Greater detail on this system is contained in Kentucky's July 1967 report, Water Resource Planning in Kentucky.

In 1966, new state legislation was passed which greatly strengthened the legal status of water resource development in Kentucky. The legisla-

tion established the Division of Water in the Department of Natural Resources and also the Water Resources Authority of Kentucky, which was given broad fiscal and regulatory authority. The Division of Water was designated as the operating arm of the authority, and the director, Division of Water, was designated the executive director of the authority.

As the water resource planning agency of the State, the Division of Water has adopted a five-year program designed to:

- * Augment water planning coordination capabilities.
- * Upgrade the planning capabilities within the Division of Water.
- * Complete a water resources planning framework which will be useable as a sophisticated and effective tool for planning.

The last element of the five-year program is the subject of this commentary - that of developing a computerized information system. To initiate this system, Spindletop Research, a Commonwealth research agency, was requested to develop the concept and sets of procedures.

Requirement for a Computerized System

The decision to obtain the advantages inherent in digital computer manipulation was made because of the growing intricacy of correlating a state's economy with its water resources. Even though water resource planning is complex today, problems will become even more subtle and complex in the not-too-distant future. Where some of today's problems may seem solvable by the development of available water supplies, many of tomorrow's problems may only be solvable by reducing the demands for water through enforced priorities. With this dual role in water resource planning, many decisions will require several types of inter-related data which should be readily available to the decision makers and planners.

Since water resource development requires substantial investments by federal, state, and local governments and since the justifications for water development projects are derived from a variety of benefits, of which economic development is a key one, planning for water resource development has become a complicated process. The complexity is increased if we realize that water development may bring economic development which may, in turn, bring significant changes in migration and in water consumption trends.

The computerization of many of the federal sources of information and the desire for compatibility of regional data sources with the federal systems indicates that a computerized system is feasible.

In the long run, a computerized planning procedure would be capable of doing the job for less money. Since an information system must be developed for any method of comprehensive planning, other methods could cost as much to initiate as a fully computerized one. Consequently, the Commonwealth felt it wise to provide for the development of the computerized system.

Information System Features

The purpose of the information system is to store useful data and through developed procedures, present and information required by water resource planners. Initially, this information will be in the form of summaries. Later, computerized programs will be provided for projecting and forecasting data and for interrogating the system with unstructured requests.

The principal features of the system are:

- * Ability to receive data in any form. Such a great mass of data exists that it is beyond local capabilities to collect it and place it in a data bank. The system is designed, therefore, to receive data collected by others, regardless of the form in which the data exists.

- * Ability to receive data covering any geographic area. Data collected by others is assembled in various geographic components, ranging from national level to regional groupings, to county units and to watershed. The system is designed with a flexibility which permits receiving data regardless of geographical coverage.

- * Ability to provide for missing data. Certain important data simply does not exist, i.e., availability of ground water in all areas. The system, therefore, will develop the data by empirical means or at least reserve space for such information should it ever become available.

System Characteristics

A major difficulty in correlating a state's economy with its water resources is that interflow of economic parameters is no respecter of river basins. Similarly watersheds do not ascribe to political boundaries, except coincidentally.

To provide the system with the flexibility required to accept data from sources regardless of the geographic area concerned, the state is divided into approximately one thousand basic geographic units which are called "zones".

A zone is that portion of a "small watershed" which lies in a county.

The term small watershed is defined by the Soil Conservation Service (SCS), U.S. Department of Agriculture. There are approximately 550 of these small watersheds in the State. Aggregates of these small watersheds conform to the basin and sub-basin delineation published by the Office of Water Data Coordination, Department of the Interior.

Figure 1 illustrates the basic geographic unit - the zone. The upper diagram shows that the zone is that portion of the small watershed which lies in a county. Of course, there are other zones in the rest of the county which are not crosshatched in this diagram.

In the lower diagram, a series of watersheds is superimposed on a series of political boundaries denoting counties.

Note how the zones are formed where the two geographical plats overlay each other.

Note also that the zones can be summed to add up to a county - or to add up to a small watershed.

Zones are cataloged in the information system by latitude-longitude coordinates which define their boundaries. This is a tedious task, but not overwhelming. Two Transylvania graduate students completed the Kentucky River Basin during this summer.

This procedure also has great flexibility. Take population data, for example, which is routinely available by Standard Metropolitan Statistical Area (SMSA) and by county. Assume that county population is entered into the computer system. By first deducting any city or town population from the county total, the remainder can be allocated to zones by empirical means; for example, by multiplying the county rural population by the ratio of the zone area to the county area. The zones then can be aggregated to add up to the small watershed - and a reasonable estimate of the population in the small watershed obtained.

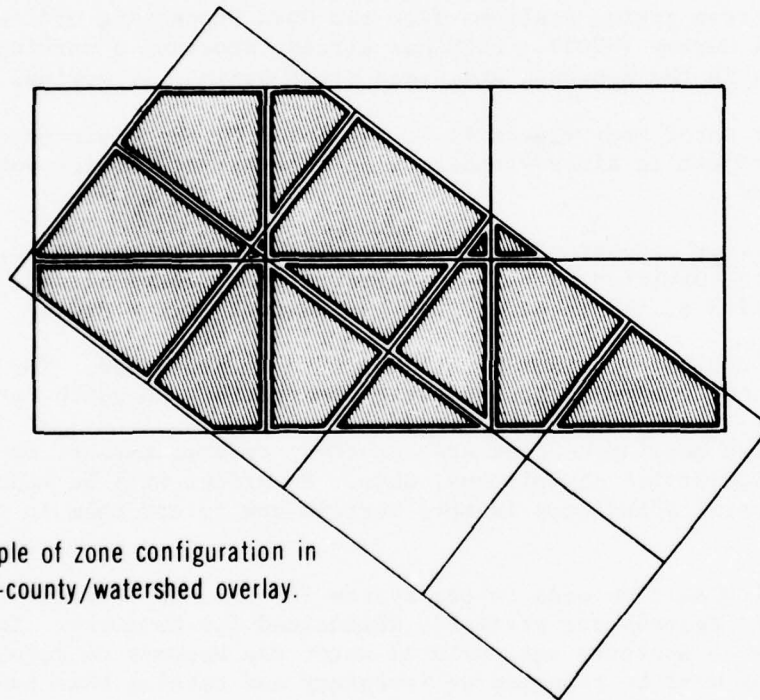
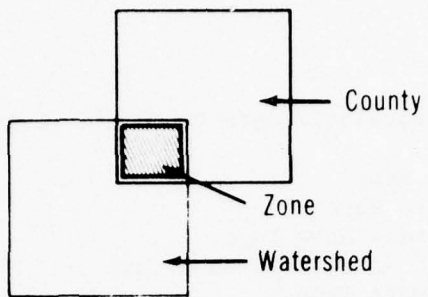
The zone breakout, in effect, permits data collected only on a political boundary basis (economic parameters, population) to be machine sorted in terms of small watersheds. And conversely, it permits watershed data to be aggregated by political boundaries.

With respect to assembling the data base for this system, certain common sense guidelines were adhered to:

- * The system must fulfill the requirements of the Kentucky Division of Water.

- * Updating the program must not present an imposing task.

Initially, at least, the use of hydrologic data already on magnetic tape or punch cards must be exploited to the fullest.



Example of zone configuration in
multi-county/watershed overlay.

Figure 1.

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The most useful hydrologic data tapes are listed below:

- Rainfall Data Tape
- Streamflow Data Tape
- Major Water Users Data Tape
- Reservoirs and Structures Data Tape
- Ground Water Data Tape
- Water Quality Data Tape
- Agricultural Water Data Tape

Briefly, experience has been:

* A rainfall data tape for Kentucky stations can be structured by the U.S. Weather Bureau, but at prohibitive cost - \$35,000. Instead the State will gradually transpose to tape 20 years of record on punch cards in the Commonwealth's Climatological Office. This will be done by machine and will be much cheaper.

* Within five months, it appears that the State can obtain a tape for Kentucky stream gaging stations from the Data Processing Office, U.S. Geological Survey (USGS). USGS has already provided a working tape of the stations in the Kentucky and Green River Basins, at nominal cost.

* A major water user tape will be assembled by the Division of Water. This project is already underway in response to requirements of new Kentucky law.

* A reservoir and structure data tape will also be assembled, gradually, by the Division of Water. Summer students have already completed the portion of the inventory for the Kentucky River Basin.

* The Ground Water Data Tape will have to be postponed. The USGS has just commenced recording ground water observations on punch cards.

* The Water Quality Records are recorded, to some extent, on punch cards in the USGS Office at Columbus, Ohio. No effort will be made to acquire these until Spindletop is more certain how to use them in the program.

* Provision must be made in the system for the use of water for agriculture. No records are presently maintained for Kentucky. In future years, when Kentucky agricultural water use becomes of more importance, Spindletop must be prepared to inventory and catalog this use in the system.

Hydrology, however, is only a part of the data required for the Kentucky Water Management Information System. Of equal importance is information on associated land use. It is fortunate that SCS has recently completed a Conservation Needs Inventory for Kentucky. This inventory has subdivided the Commonwealth into 13 sub-basins, 543 small

watersheds (the same as Kentucky's management system will employ) and 1,018 zones (defined as the portion of a small watershed that lies in a county).

The inventory contains classification of land for various purposes and identified land potentially irrigable by county. The information is on tape and is understood to be available when needed. As time permits, and as the need arises, this county-oriented data will be further broken down to the small watersheds and zones adopted as basic geographic units.

The system also requires an economic data base which will permit an association of the economic potentials with watersheds and river basins. Initially, this task poses a problem for local collection and input into the system.

While the Office of Business Economics (OBE) plans to produce a regional information system which will be on tape or cards, it will not be available in the near future.

OBE will publish employment and personal income by industry income distribution, and demographic data by economic subregions in 1968.

However, Spindletop has personal income by major source within the State and estimates of county personal income.

The geographical location of industry by Standard Industrial classification (SIC) designation is available on a county basis from Kentucky departments.

Water use data by major user are being assembled by the Kentucky Division of Water.

National water use data are available in publications.

Value added figures on industrial output, by SIC code, are available through a combination of Kentucky and U.S. Department of Commerce data.

Initially, therefore, it will be possible to incorporate into the system a means for estimating future water requirements by zone for two-digit SIC code users. (By using accepted employment projections.)

Similarly future population water use can be estimated from municipal water use data and population projections, also by zone.

These zone estimates can be aggregated to sum up to either the watershed or county of concern.

There is the possibility that the University of Kentucky and/or

Spindletop Research will, in the near future, develop an input/output model for Kentucky. Such a model estimates the increase in output of an industry "A" which results directly and indirectly from an increase in output of an industry "B". The output of "A" increases because its product is used directly (or indirectly) in "B's" production. This would permit estimates of potential water withdrawal in any area to be associated with increases in industrial outputs elsewhere. A determination can then be made as to whether regional water resources are sufficient to sustain long-term growth in particular industries.

In addition to the basic data tapes already discussed, Spindletop is planning to include transportation (and important telecommunications) data, and recreation and conservation data. It is anticipated that these inputs will evolve as the requirements and potential benefits of the information system materialize. For example, the Kentucky Department of Fish and Wildlife Resources has already suggested a four-digit coding system to classify their available information.

To summarize, the kinds of data just described are:

- Hydrology
- Economics
- Land Use
- Demography
- Transportation
- Recreation and Conservation

Assembly of these data, which constitute inputs into the Water Management Information System, will form a source file for State planning.

The Water Resources Council has defined a framework (Type I) study as a broad guide for the best use of water and related land resources in an area. The elements needed for such a study are, briefly:

- * Economic projections
- * Economic projections translated into needs for water
- * Estimate of water availability
- * Estimate of related land availability
- * Discovery of problem areas
- * Comparison of alternate solutions

When these elements are compared with the data base outlined, it becomes evident that the State will have what it needs for comprehensive Type I basin studies.

Presently, analysis is being made of the required data which must be selected from the source files for the zones of an entire river basin, the Kentucky. Selected data will be transcribed into the computerized system by geographical classification, which forms the basic framework as previously described. The zones will form the "basic building blocks" for area information. By aggregating zones, any larger area can be derived. However, provision must be made for area data which are not segregated to zones within the area. Concurrently with the selection of data, data gaps and requirements to fill the gaps must be specified.

The first set of computer programs will be composed of methods for aggregation, disaggregation, and summarization of data. Problems will arise due to difficulty in disaggregation to smaller zones and because of missing data. To handle these problems a set of empirical data will be compiled, examined for plausibility, and changed when gross errors are indicated.

The first programs will be relatively unsophisticated, with provision to permit change when management identifies erroneous results.

Even in the initial stages of development, the system should prove a useful tool for management by providing many types of valuable information. Annual reports and catalogs could be inexpensively and easily compiled. For example, the hydrology, economics, and population of the Kentucky River Basin could be presented in detail or in summary form. Programs will permit an approximate, seasonably adjusted determination of small watershed runoff from rainfall. Summaries of land use by County can be rapidly assembled. County totals of land use can be segregated to zones and then summarized by small watershed. Water use by zone, for both major industry and municipality, can be summarized by either county or small watershed. Using employment and population projections, simple forecasts of future water use requirements can be made and compared with estimates of water availability.

In the next several years, as the system develops, and experience is gained in its use, improved methods of segregating and forecasting will be programmed. Data for other river basins will be accumulated, put on tapes, and analyzed for completeness. Then methods for optimizing state expenditures on water development, planning, and research will be evolved, and the problem of detection and isolation of specific planning requirements will be analyzed. The simple, or state-of-the-art, procedures initially used for forecasting will be updated to use more sophisticated (and accurate) methods. To proceed to the ultimate, if the OBE develops the regional information system proposed, and if appropriate criterion functions can be agreed upon, it should be feasible to derive almost optimal planning by maximizing expected differences between benefits and costs.

Not included in this description are the many technical details

that required consideration in the concept of this Water Management Information System. The complexities of geographic entries into a computer system, coding, topical classifications, dissimilar units of measurement, and conversion programs to assure response in like units, machine feedback and interaction, size and number of planning tapes, provisions for response because of unavailable data, handling of quantized data with respect to time were a few. A discussion of these considerations is contained in Kentucky's July 1967 report, Water Resource Planning in Kentucky.

The final development of this system is an integral part of the Commonwealth's five-year program. It has been noted that with the selected data base described, the State will have the source file to conduct framework studies defined as Type I. However, with the improved methods of segregating and forecasting, which will be developed, the scope and intensity of planning should extend beyond the generalized Type I area study. The system has the potential to define, evaluate, and formulate projects - approaching the Water Resources Council's definition of a Type II study. It should carry project definition to the point of design - but no further.

CHAPTER 3
KENTUCKY WATER SUPPLEMENT

PART II

PART 5
INTERIM APPALACHIAN KENTUCKY
DEVELOPMENT PROGRAM

September 1967

This document was prepared by the Area Development Office, Commonwealth of Kentucky, in conjunction with overall development programming activities financed in part by grants from the Appalachian Regional Commission and the U.S. Department of Housing and Urban Development. Spindletop Research Inc. provided staff assistance in the compilation and preparation of this report.

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Foreword

The Commonwealth of Kentucky is committed to the definition and implementation of a comprehensive program which will successfully guide the selection and prosecution of those public and private actions which will most effectively accelerate the creation of a permanent capacity for growth and development in Appalachian Kentucky. The Commonwealth has been committed to this policy in state government since 1960, and support of this policy is reflected in the attitudes and programs of Area Development Councils and the broad range of local, public, and private organizations which make up the Council memberships.*/

*/ Preliminary Development Outline for Appalachian Kentucky.
Prepared by the Kentucky Area Development Office, Office of the Governor, Frankfort, Kentucky. June 1966. (Designated hereafter as the Preliminary Outline.)

I. INTRODUCTION

Background

In June of 1966, the Kentucky Area Development Office published a Preliminary Development Outline for Appalachian Kentucky. The purpose of that document was to serve as an interim guide for development actions until a more definite statement could be designed.

This document then represents the second refinement or statement of the Kentucky Appalachian Program. While it is more definitive than the Preliminary Outline, it does not represent the final statement of the program. Since the process of development is both iterative and evolutionary, no final statement is really anticipated - rather it is anticipated that from time to time improved statements will be developed so that each successive investment decision or development action is more effective than the last.

The Kentucky Development Process

The Appalachian Kentucky Development Program design process consists of four basic components which provide for:

- * Technical analysis and innovation
- * Citizen innovation, decision, and action
- * Project selection
- * Project funding

The technical analysis and innovation component is being provided by the coordinated efforts of the Kentucky Area Development Office staff, Spindletop Research personnel, and state and community leadership. The work program for the design of a comprehensive development program for Appalachian Kentucky as a whole and for each area calls for three design phases to be completed by March 1968.^{2/} The work plan provides for citizen participation and recognizes the need for project selection and funding prior to the completion of the design work.

The necessity for project decision and implementation prior to completion and maturation of the comprehensive program for Appalachian

^{2/} This design work is funded in part under provisions of Section 701, Housing Act of 1954, administered by the U.S. Department of Housing and Urban Development pursuant to Section 213, Appalachian Regional Development Act.

Kentucky has been explicitly recognized by Kentucky in the Preliminary Outline and by the Appalachian Regional Commission (ARC) in its staff paper, Developing a Strategy for Growth, October 1966.

The Preliminary Outline states:

The work plan (cited above) is designed to take into account the fact that the various investment interests (federal and state) cannot wait until a comprehensive program is developed before initiating projects the work plan has been conceived as a three-step process, with each step producing programs containing more comprehensive project coverage . . . with continued effort directed toward refinement and expansion.^{3/}

The ARC staff paper comments from a different viewpoint:

State Appalachian Development Plans will be steadily improved and refined each year. The plans will not in any sense be static "master documents," but vehicles for improving the effectiveness of the program by making the Commission's investments more and more relevant to the permanent, long term development of a diversified self-sustaining economy in Appalachia.^{4/}

In the overall development process, therefore, the ongoing reality of events in Appalachian Kentucky, the program design effort, and the interim strategies can be viewed as occurring in parallel. As the analysis of the area gives clearer insight into goals, problems, and solutions, increasingly improved programs, with local citizen participation, will mesh with, engage, and then become an integral part of the functioning community.

Program Status

In Appalachian Kentucky it has been asserted that:

Since the actions which relate to the capability and productivity of individuals (Human Resource Development goals) are capable of more immediate determination and utilization, greater priority has been assigned in the

^{3/} Preliminary Outline. pp. 9, 11.

^{4/} Developing a Strategy for Growth. The Appalachian Regional Commission, Washington, D.C.: October 1966, p. 3.

initial program phases to investments and actions related to these goals. This phasing, while justified, required a concentration in the creation of an initial comprehensive plan of development at the earliest time to allow the equating of subsequent investment decisions between the locational physical resource development activities and the "mobile developmental benefits" achieved in human resource activities.^{5/}

The initial activity in the Appalachian Kentucky Development Program conforms to this strategy in the following ways:

- * Initial investments of Kentucky's Appalachian funds have been made for roads to break down the fundamental physical isolation and for water resources planning. Most remaining initial funds have been concentrated in educational facilities including vocational schools, educational television (ETV), and a program of expansion of community college facilities which serve higher education.

- * There has been heavy commitment of funds to health facilities planning, initial requests for facilities funding, and a proposal for a substantial health facilities demonstration project.

- * Concurrently, there have been processing and approval of a wide range of projects funded by federal agencies other than ARC, especially the Economic Development Administration (EDA).

- * There has been concurrent funding of projects by the state and the beginning of significant investments by private manufacturing firms in Appalachian Kentucky.

- * Also concurrently, the comprehensive program design work plan has been in operation since April 1966.

At the present time the design phase and concurrent function of the Appalachian Kentucky Development Program have proceeded well beyond the status of the program described in the Preliminary Outline. With the highway program, vocational school construction, and ETV facilities construction well along and a state health plan in existence, it is possible to give increased attention to the full range of Appalachian goals.

The analysis, program design, and local contact within each of the multicounty areas in Appalachian Kentucky have proceeded to the point where substantive program decisions can be made with respect to the development of viable economies and to location of potential urban service areas as discussed in pages 37 through 40 of the Preliminary Outline. Further, and more importantly, the nature of "investment dis-

^{5/} Preliminary Outline. pp. 3, 4.

criminator," or criteria, for programmed choice among projects on the basis of the overall strategy has become clearer. These policies are explicitly stated in Section III, "Strategy for Development."

Program Implementation

Beginning in 1960, multicounty districts were formed in Kentucky to pursue developmental goals. Within each multicounty district there is a representative body called an Area Development Council. These counties typically include the principal elected officers from each member county; representatives from commerce, manufacturing, and banking; community representatives from professional groups and service clubs, plus any interested persons willing to take the time to participate in council activity. Officers and an executive committee are elected from the larger council and serve as the point of contact between the council and the Area Development Office. The Area Development Councils are a vital element in the complex of organizations by which the Commonwealth seeks to coordinate the efforts of state government to achieve developmental objectives.^{6/} Communication between the Area Development Office and each Area Development Council is a two-way street enabling the multicounty area to contribute materially to the formation of its area development programs and enabling the Office of the Governor to advise the council of the state's programs and to extend technical assistance to the council in devising its area program of projects.

The Area Development Council is also the instrument for implementing Appalachian Development Programs being prepared by the Area Development Office under provisions of Section 213 of the Appalachian Regional Development Act.

The boundaries of the present districts were established by executive order of Governor Edward T. Breathitt in April 1967.^{7/} The boundary and name of each development area are shown on Figure 1.

The newly reformulated areas were designated after consultation among state agencies, the University of Kentucky, other state institutions, and local leaders. In general, each development area is a

^{6/} Preliminary Outline. pp. 41-47.

^{7/} The Buffalo Trace Development Area includes three non-Appalachian counties. No council has been formed in the four-county area which includes Lincoln and Garrard Counties in Appalachia. Monroe County is included in the programming through the operation of the Upper Barren River Development Council, an essentially non-Appalachian area not reviewed in this document. Taylor County in the West Lake Cumberland Development Area is not an Appalachian County.

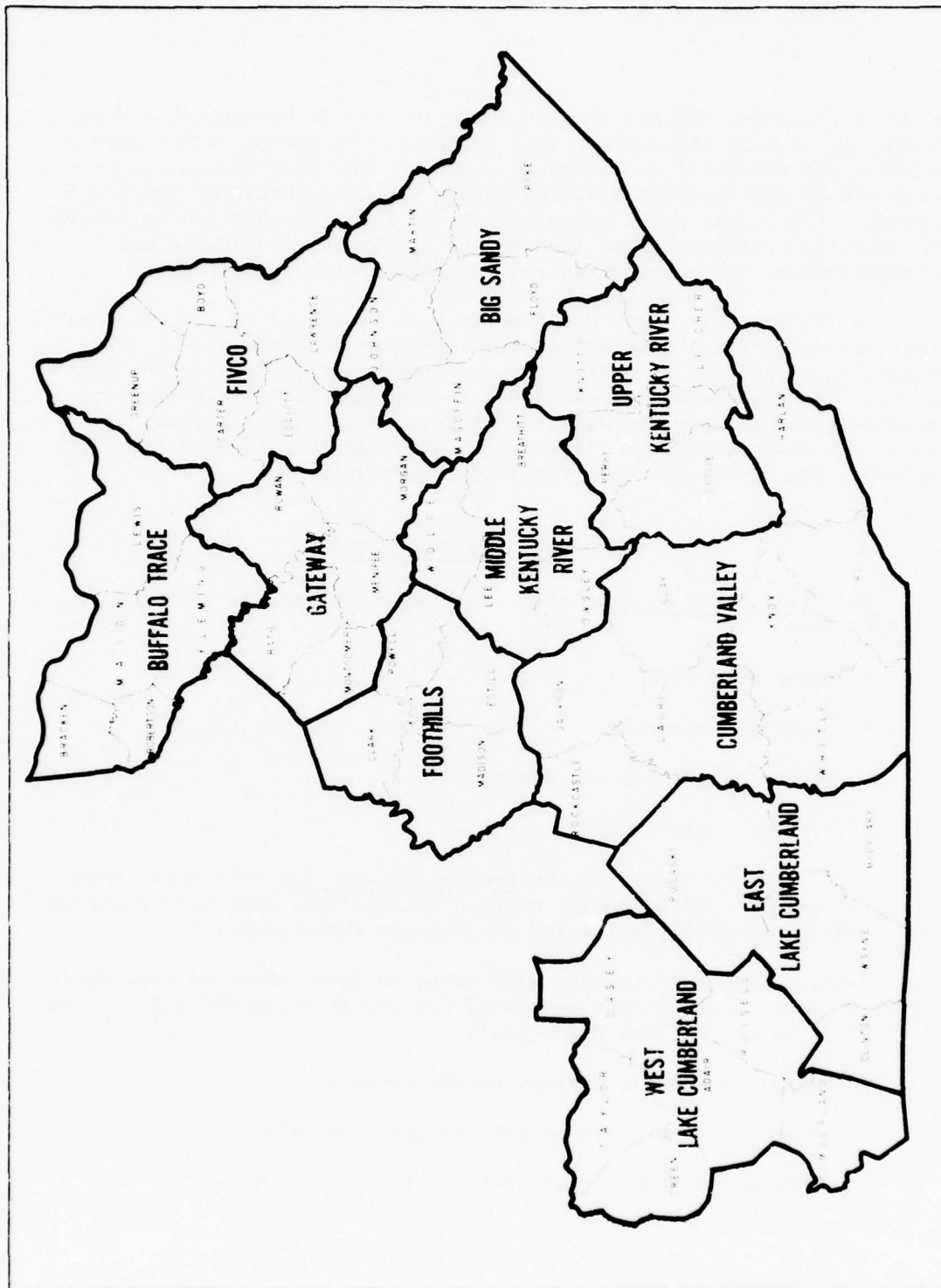


Figure 1. Official Development Areas--Appalachian, Kentucky

group of counties related to a principal market or commercial center. There are in each development area one or more locations which have a significant potential to become an urban service area in accordance with one of the objectives stated in Section III, "Strategy for Development." The urban areas are also related to each other and to outside metropolitan concentrations (Lexington, Cincinnati, Knoxville and Charleston) by the Appalachian and Interstate Highway Systems.

In the appendix, each development area is discussed and strategic factors identified to the extent that they can be perceived at this stage in the process of designing more comprehensive development programs. The discussion for each area is a summary of the development area programs as they now exist in draft form for local review, revision, and implementation. These draft plans and their supporting data books^{8/} are basic documents for program guidance.

II. GOALS AND OBJECTIVES

The Preliminary Outline cites four major categories of needs pertaining to:

- * Human resources
- * Physical resources
- * Public facilities and services
- * Private facilities and services

It is further stated in the Preliminary Outline that while need is an acceptable criterion for certain welfare programs, need alone is not sufficient justification for development investments.

Rather, the justification will arise in those areas of need where there is also a significant potential for growth - and where growth is defined in terms of three prime goals:

- * To help incapable persons become capable
- * To help unproductive persons become productive
- * To help nonviable areas develop viable economies

^{8/} Development Data Books, compiled by Spindletop Research for the Kentucky Area Development Office, have been published and updated for each Appalachian development area.

Further work with indications of needed actions, received from various state and local sources, has led to a restatement of these objectives. The goals of the Appalachian Kentucky Development Program may now be stated.

GOAL 1 - Increase Effective Family Income

Achievement of this goal is crucial to the realization of a viable economy since viable economies do not survive in a climate plagued with low incomes. Increased family income is both a developmental goal and a monitoring device for judging economic progress. Measurements of family income levels and distribution provide excellent indexes of the state of economic progress.

While all of the functional programs have elements which have an indirect effect on family income, and most have elements with a direct impact, two programs have been identified as the ones which primarily serve this goal as it is recognized in Appalachian Kentucky. These programs are entitled: "Industry and Commerce," and "Tourism and Recreation". It is also recognized that the construction of public and private housing and industries based on natural resources (agriculture, forestry, and mining) can be major sources of personal income.

GOAL 2 - Improve Health and Education

The more specific definition of this goal is to help make incapable persons capable and unproductive persons productive. The pursuit of this goal contributes directly to developing a viable economy since, if the public and private endeavors are to be successful, the people who work in the firms and agencies must be healthy and well trained. It is imperative that these persons be able to live and work in Appalachian Kentucky, or wherever else they may choose, without penalties imposed by reason of disease or poor training. It must also be recognized that the attainment of adequate levels of health and education services is a goal in itself apart from its economic effect.

The first target in progressing toward this goal is to achieve levels of health services, educational opportunities, and training which approximate the levels found in other sections of the United States. Once these levels are reached, Appalachia will be in a more competitive position to sustain economic growth by attracting industries desiring a healthy, educated labor pool. At this stage, out-migration can be curbed and immigration may soon follow. The programs most appropriate for this goal have been entitled: "Health" and "Education".

GOAL 3 - Improve Management and Utilization of Natural Resources

The achievement of this goal contributes to the objective of creating a viable economy. Resource abuse by nature and man has impeded economic development in a variety of ways; timber overcuts, floods, and extensive strip mining are examples. Until recently, poor conservation practices plagued the region. We are now beginning to see cures effected through better management practices in several areas. However, much remains undone, especially in improving management of natural resources such as water, minerals, land and timber. The programs for this goal are entitled: "Water Resources Utilization," "Land Resources Utilization (including minerals)," and "Timber Resources Utilization".

GOAL 4 - Expand and More Effectively Place Manmade Capital Resources

Achievement of this goal also serves the objective of developing a viable economy. Expansion of facilities in Appalachian Kentucky is growing at a faster pace than ever before. However, the placement of facilities has not always been consonant with developmental objectives and goals. The interrelationships between these manmade resources are strong but can be further strengthened with developmental programming.

Transportation facilities are classical developmental items. Transportation involves the movement of goods, people, and messages between communities. This function must continue to receive primary emphasis.

Urban services flow from community facilities located and grouped at points to serve urban concentrations and to realize scale efficiencies. In addition to schools and medical services, there are public safety, water supply, sewage disposal, utilities distribution, and local governmental functions.

The impact of the home upon the family and the productivity, health, and happiness of individuals directly supports the income, health, and education objectives. Furthermore, housing construction and repair form a significant portion of the national economy but not of the Appalachian economy. However, the objective of a viable economy will be supplemented through this goal as progress manifests itself in new and well-kept housing. The housing program will also have a key role in creating adequate urban service areas for each development area. The programs for this goal are entitled: "Transportation," "Community Facilities", and "Housing".

III. STRATEGY FOR DEVELOPMENT

In accord with the strategic intent of the Appalachian Regional Development program, the Kentucky Program is intended to devise a comprehensive range of actions affecting all levels of programs, public and private, in such a manner that the concerted investment of dollars and actions will tend to make the most significant contribution to growth and development. . . . In all cases, these developmental benefits will be sought as identifiable extra increments of contribution to growth and development over and above the normal purpose or technique required in a given functional program.^{9/}

Bases for Investment Decisions

Experience to date with the goals of the development program in interaction with the strategic intent, as stated in the above excerpt from the Preliminary Outline, has led to recognition of differences among projects with respect to the basis upon which investment decisions may be made. Further, these differences lie along more than one dimension.

First, with respect to geographic location, it is necessary to distinguish between projects that are to be located where they may be expected to enhance the potential for growth of the economic and social system and projects which, because of physical relations inherent in them, must be put in a particular place to serve developmental purposes. As examples, location of a project to serve the objective of developing modern, adequate urban service areas would be contingent on identification of those areas where a potential for urban growth appears. On the other hand, the recreation or resource development project usually will require location at or near some suitable attraction or resource.

Second, it is necessary to recognize how a project relates to the physical location of the people affected. If a project, such as a school, has a useful life of 20 years and will not be used unless conveniently placed, its contribution to developmental purpose will dictate its placement as near the people to be served as scale efficiencies and expected use over the life of the facility will permit. On the other hand, if the developmental purpose of the project is to enhance the desirability of a potential urban service area and attract people to it, the distribution of the present population will be of less consequence. The extreme case occurs where a project appears as part of a "new town", and the intent is to create an adequate urban service area where few people now live.

^{9/} Preliminary Outline. p. 4.

Third, there must be a recognition of the relationships among the goals of the Appalachian Kentucky Development Program. For instance, although the development of an expanded housing industry will create new jobs, the new jobs created will not by themselves continue to sustain the housing industry. The housing industry must look to expanded industry and commerce to create the family income which must, in turn, sustain the housing industry. As another example, any workable program of industrial promotion or housing development must rest on a parallel program of expansion and improvement of urban services.

Policy Guidelines

Considerations of this kind lead to a statement of policy guidelines which, in combination with recognition of program intent and geographic factors, constitute an initial definition of what have been heretofore labeled "investment discriminators". These policies are:

- * Employment opportunities will be supported wherever they occur and can be reasonably expected to survive in relation to national or local markets and materials sources.

- * Development opportunities will be supported which take advantage of the area's resources, physical and human, wherever they occur when scale considerations and use over time do not require concentration or the resource is not mobile.

- * Urban service centers will be established to provide an efficient system of services for the population, industry and commerce, and the region.

The first policy guideline implicitly recognizes that the economic relations among the area, the region, and the rest of the nation are paramount. The critical element is that the new business, or expansion, or other basis for employment must be reasonably expected to survive.

The second guideline deals with that class of projects where the physical character and distribution of the physical or human resources influence location of projects.

The third guideline leads to definition of urban service centers and delineation of their areas in Kentucky on the basis of their potential for supplying a full range of modern urban services to their respective areas with relationship both to overall development area urban service needs, and to linkages with metropolitan areas related to and even outside of each development area.

The definition of growth inherent in these policies is (a) the increase in per family effective income over time accompanied by (b) a

reduction in numbers of families with inadequate incomes, with (c) an increase in the availability of modern urban services, (d) an increase in effectiveness of the management of available natural resources, and (e) establishment of an effective program of manpower development.

In approaching the question of where to locate public investments, two bases for such decisions must be recognized:

* Investments for the improvement of manpower and natural resources should be oriented toward the location of the resource. Where convenience is necessary to effective use, the facility to improve manpower resources should be located as close to the people to be served as the necessary scale of an effective project will permit. Projects functionally related to an immobile natural resource or scenic attraction will of necessity be appropriately placed.

* Investments in physical facilities or services where the intent is to provide a complement of community urban service facilities to serve developmental purposes should be placed in geographic areas where it may be determined that a potential for growth exists.

Two further factors must also be recognized. First, physical facilities can wear out. A facility designed to serve a present purpose in loco need not discourage placement of similar facilities elsewhere later. A school may be built to serve a present generation even though their children may establish their families in another location more amenable to service.

Second, and more importantly, the long term effectiveness of public investments depends on identifying those situations where a single factor or a small investment need is the last of a group of necessary conditions for long term or accelerated growth to occur and an investment that the private sector cannot reasonably be expected to make. This leverage is further enhanced if the project itself is strategic to several other projects.

Developmental Strategy

Appalachian Kentucky can be developed into a viable region where family incomes are adequate and the residents are served by modern urban-type facilities. There is no single dominant program to achieve these goals. Each multicounty development area has its unique characteristics and strategy for development. However, when the programs for each area are fitted together, the regional pattern and strategy are more than the simple sum of the area patterns and strategies. This is true, because programs support each other among all areas.

The initial strategic moves in the development of Appalachian Kentucky have been mentioned. First, there has been the commitment to

construction of a network of highways which will break down the basic isolation of Appalachia. The next step is placing these roads in service by an access road program, then filling out the system by connecting those access road segments which will augment the basic system. This is the situation on Kentucky Highways 80, 7, 11, 52, and 35. Through roads will eventually be built out of these highways, but their construction will be justified a few miles at a time on the basis of local access requirements.

Second, there has been the heavy commitment to vocational education and ETV. The next step here is analogous. Local actions are needed to increase the effectiveness of the new programs and relate them to industry, public education, and institutions of higher learning.

The need for highways was so obvious that the initial commitment was made in the Appalachian Regional Development Act itself. The Act designated mileage and authorized funding. The need for educational investment was equally obvious. Kentucky resolved the problem of where to put the educational facilities by placing them near the people to be served.

The next step involves a different kind of decision. The question is, with the very large and obvious decisions made, how does one go about placing public investments to build viable self-sustaining communities in which the urban-type services afforded to its citizens are at least on a par with the balance of the United States? The response to this question is found in the discussion of "Urban Service Areas" in Section V of this report. It should be noted also that the urban services package not only includes housing, transportation, and community services and facilities but health and education services and facilities as well.

To discuss the strategic role of management of natural resources, it is necessary to point out that of the four Appalachian goals cited in the previous section, effective management of the region's natural resources appears in a supportive role with respect to the family income and urban service objectives. In its supportive role, the natural resources programs divide into two types; i.e., the management of water and land surface as fixed externally given quantities, and programs in support of the extractive industries which use natural resources (agriculture, timber, and mineral industries).

Water resource management is a very strategic element in development programming for Appalachian Kentucky because it becomes involved in three programs in a wide range of situations: flood damage control and expansion of developable land, industrial and urban water supplies, and recreation use of water surface. The inclusion of the expansion benefits concept in Appalachian water resource planning permits inclusion of downstream development potential in benefits attributable to water control structures.

In development programming for Appalachian Kentucky the land resource management program addresses itself to the problem of how to distribute a finite land surface among competing uses. The problem is severe, because rough terrain and flooding render much of this surface unusable for program objectives. This means that in Central Appalachia in particular, the effective use of the extremely limited usable land area becomes of paramount concern. Since expansion of employment opportunities requires expansion of manufacturing and commerce activity, and these are urban land users, land surface apportionment becomes intimately involved in the Housing and Industry and Commerce programs. The expansion of usable land in such areas as the Big Sandy, Kentucky River, and Cumberland Valley Development Districts is critical and involves not only water resource management but consideration of increased use of hillsides and land disturbed by strip mining.

Agriculture appears as a major land surface user and employer primarily in the development areas outside of Central Appalachia. Expected changes in land use have important implications for shifts in agricultural land use. (See Table 1.)

The most striking feature of this table is the rise in pasture land of 224,000 acres and reforestation of another 253,000 acres. If the forecast is valid, the increase in pasture land in particular implies a sharp rise in the cattle industry, and the expansion of the marketing and supply businesses which serve it.

The increase in timberland implies improvements in the management of timber resources at their source. There is also the problem of utilizing the low-value species of hardwoods which are not now being harvested at desired levels. The development of a program of improved timber resource management can be an important contribution to employment opportunities as well as to the solution of housing materials supply problems in Appalachian Kentucky.

The history of development of Appalachian Kentucky in general and Central Appalachian Kentucky (Big Sandy, Kentucky River, and Cumberland Valley Development Districts) in particular, has been intimately related to the history of the coal business. Aside from locally important petroleum production and some limestone quarrying, coal mining is the dominant mineral industry. One of the factors that resulted in overpopulation of Central Appalachian Kentucky was the systematic recruitment of laborers to mine coal in the 1910 to 1920 period. When the industry went through its depression and finally mechanized, there was no equally systematic procedure for outmigration.

Recently the coal industry has gone through profound changes that affect the course of development in Appalachian Kentucky. First, the impact of the loss of the home and transportation fuel markets ended allowing the full amount of the increase in coal use for electric power

Table 1

EXPECTED CHANGES IN LAND USE--1958 to 1975
APPALACHIAN KENTUCKY REGION

	Acres (000's)		Percent Change ^{10/}
	1958	1975	
Cropland	1,515.7	1,453.6	(4.1)
Pasture-Range	1,304.9	1,529.3	17.2
Forest-Woodland	6,530.3	6,783.5	3.9
Other Land ^{11/}	55.2	18.7	(66.2)

generation to be reflected in production increases. Secondly, the shift in coal mining technology is requiring a different kind of employee. Modern mining employees must handle increasingly complex equipment involving retraining. There is currently a severe shortage of mining employees in juxtaposition to groups of unemployed miners.

Two results are of importance to development programming in the region. First, incomes earned by employees of modern mechanized mines, especially when supplemented by earnings of other members of the family, yield family incomes high enough to change consumption patterns. Second, coal mining companies, with a fundamentally stable market, will be participating in community development programs on a scale and in a way that departs from past tradition. This participation will involve both local investments and increased contributions of executive ability by management personnel.

^{10/} Parentheses donote declines.

^{11/} Includes idle land and wildlife areas. Also includes cross-road filling stations, rural nonfarm residential sites, churches, and school grounds where these occur in built-up areas of less than ten acres.

IV. REGIONAL SOCIOECONOMIC CONSIDERATIONS

Introduction

Appalachian Kentucky, as defined for programming purposes, is a 50-county region in eastern Kentucky, organized into 10 development areas. (See Figure 1)

Topographically, there are five different types of terrain which have an important bearing on developmental programming. First, there is the mountainous Central Appalachian area typified by the Big Sandy, Upper Kentucky River, and Cumberland Valley Development Areas. Second, there is the Foothills area along the edge of the Cumberland Plateau, typified by portions of the Gateway, Foothills, and East Lake Cumberland Development Areas. Third, there is the outer Bluegrass area peripheral to Fayette County. Fourth, there is the rolling land of the Eastern Pennyroyal region typified in the West Lake Cumberland Development Area. And fifth, there is the strip of six counties along the Ohio River and navigable portion of the Big Sandy River. This diversity is reflected in the programs designed for each area.

Economically, the area is equally diverse. The principal employer in Central Appalachia is the coal mining industry, and many current problems and opportunities of this part of Appalachia Kentucky rest on the fortunes of the coal business. The Foothills economy features small farms, small manufacturers typically in the needle trades, and marginal coal operations. The bottomlands along the Ohio and navigable portions of the Big Sandy River are the locus of primary metals, petroleum refining, and chemical industries. The Eastern Pennyroyal and outer Bluegrass areas are agricultural with varying degrees of dependence on tobacco as a cash crop. Throughout the area, diversity and variation in topography together with manmade water impoundments produce attractions for tourists.

The area is also demographically diverse. The Central Appalachian section is characterized by dense rural nonfarm communities situated along principal highways and concentrated in narrow valley floors. The Foothills areas are relatively empty, as is the Eastern Pennyroyal. The outer Bluegrass section is undergoing urbanization as Fayette County increases in population and economic activity. The area as a whole sustained a heavy population loss during the 1950's (144,770) which together with natural increase, added up to an estimated net outmigration of about 320,000 people.

The outmigration was concentrated in the 25 to 40 age group, but there was a decline of population in all age groups under 55 years of age. This outmigration in conjunction with the high fertility ratio characteristic of Appalachian Kentucky yielded the age profile shown

in Table 2. Detailed demographic projections are being prepared and will be available early in 1968. Preliminary population estimates are shown in individual area programs.

The problems of the area are reflected in the Appalachian Kentucky Development Goals stated in Section II of this document.

In Appalachian Kentucky there are 4.08 persons to every employed person as compared with 3.24 for the state. For the region the ratio is 5.89 persons per worker employed in occupations other than agriculture, forestry, or mining, as compared to 3.97 for the state. This indicates the dependence on extractive industries and a general lack of employment opportunities. Detailed employment projections are being prepared by Spindletop research and will be available early in 1968. Preliminary estimates of employment increases are shown in individual area programs. With respect to income, 55.8 percent of families had incomes of less than \$3,000 per year in 1960; 7.6 percent, \$7,000 or more. The need for increased effective family income is apparent as is the need to expand employment opportunities.

Expanding employment, however, requires development of manpower. The age profile of the population together with the selective effect of the heavy outmigration and a long history of inadequate investments in public education result in the need for a heavy investment in adult basic and vocational education. This point is underscored by recognizing that if the private sector is to be the principal employer, then the foundation for growth is the profitable employment of an increasing number of increasingly productive people. In this light, the initial commitment of public investments in Appalachian Kentucky to vocational education is eminently sensible.

Table 2

POPULATION DISTRIBUTION BY AGE--1960
APPALACHIAN KENTUCKY REGION

<u>Age Groups</u>	<u>Appalachian Kentucky</u>	<u>Central Appalachian Kentucky</u>	<u>United States</u>
Under 25	50.7%	53.3%	44.4%
25 to 54	32.3%	31.1%	37.7%
55 and Over	<u>17.0%</u>	<u>15.6%</u>	<u>17.9%</u>
Total	100.0%	100.0%	100.0%

The pitfalls that await those who would try to depend on the expansion of tourism as the principal basis for development of Appalachian Kentucky have been pointed out in several reports, and especially that performed for the Appalachian Regional Commission by Robert Nathan Associates. On the other hand, it is an important business in Kentucky, supported by major physical attractions and historical traditions that have captured the popular imagination. Total expenditures by out-of-state travellers in Kentucky in 1966 for vacation and recreation travel have been estimated to be \$205 million which contributed \$98 million to personal incomes in Kentucky and \$24 million to state government revenues. It is big business, and there is a basis in attractions and new access highways to expand revenues from this source in Appalachian Kentucky.

Management of natural resources is also a critical element in any development programming in Appalachian Kentucky.

The problem of flooding is notorious, and in the Big Sandy, Kentucky River, and Cumberland Valley Development Districts relief of flooding of valley floors is the principal way that developable land can be made available for industrial growth.

The water that runs off is needed. Appalachian Kentucky does not have a good underground water supply, and a continuous stream of water released from water supply impoundments is needed to cope with stream pollution problems. These impoundments are also a prime basis for the tourist business and local recreation facilities.

The timber resources are underutilized. The most valuable species such as walnut and white oak for tight cooperage are generally overcut, but the less desirable species of hardwoods are being used at a rate far below desirable net annual cut. In addition there is a nearly universal absence of adequate fire and insect control, and large areas are in need of reforestation.

The improvement of the manmade part of the physical environment is a central feature of the strategy for public investments in Appalachian Kentucky. Initially, this has involved an explicit commitment to construction of the Appalachian Corridor System supplementing the Interstate System and some limited improvement in the Federal Aid System (Route 25E).

School and health facilities as well as those structures to house local government and serve the social functions of the community are a part of the environment. Facilities to house public safety organizations (fire, police, civil defense), recreation facilities, and the water and sewage disposal systems are also included. This group of facilities has been the subject of federal grant-in-aid assistance from a wide range of programs. The private and cooperatively owned utility lines and distribution systems and the communications networks complete the public manmade community environment.

The final element in the picture is housing. Of the 267,901 housing units in Appalachian Kentucky, only 91,319 were sound structures with all plumbing facilities in 1960. Of the total housing units, 61 percent were built prior to 1939. Satisfaction of this large backlog of housing in need of replacement and the annual demand for additional housing will not only materially improve the quality of life in Appalachian Kentucky, but will also serve as the basis for a housing industry as a major employer.

Industry and Commerce

The Appalachian Kentucky Region has experienced a continuous population decline since 1950. Estimates of the 1965 population indicate that the rate of decline has dropped sharply since 1960, suggesting that it will stabilize at around 900,000 in the near future. During the 1960 to 1965 period, total nonfarm employment, manufacturing employment, and manufacturing wages have all increased. (See Table 3)

Families with annual incomes greater than \$7,000 increased from 4,450 in 1950 to 23,379 in 1960. Families with annual incomes of less than \$3,000 declined from 189,295 in 1950 to 120,970 in 1960. However, this is still 55.8 percent of all families in 1960. The increase in fourth quarter wages to manufacturing employees since 1960 is evidence that there has been further continued improvement in the situation.

In 1966 a survey of the labor force conducted for the Kentucky Department of Commerce indicated a recruitable labor force of 89,580 to 99,590 in the region. The region's high schools graduated 11,376 students in 1964. This indicates the presence in Appalachian Kentucky of a labor supply adequate to man substantially increased industrial activity.

Table 3

EMPLOYMENT^{12/} AND WAGES APPALACHIAN KENTUCKY REGION

	1960	1963	1965
Total Nonfarm Employment	86,683	91,222	96,500
Manufacturing Employment	22,413	27,551	31,785
Manufacturing Wages (4th Quarter)	\$23,278,170	\$29,575,543	\$38,699,054

^{12/} Number of workers covered by unemployment compensation program. Total employment according to the 1960 Census was 227,692.

Several considerations are important in seeking to expand employment opportunities by increased industrial and commercial activity in the Appalachian Kentucky Region.

- * The heaviest population concentrations occur where the developable land is most scarce.

- * Levels of education are low.

- * Farm operators are typically over 50 years old, and 60 percent or more have no secondary education. Hence, these men may be expected to remain in agriculture, although other members of the family are available for employment in manufacturing plants located at county seat towns.

- * Few industrial development groups pursue programs which involve site acquisition, development, promotion and sales.

- * The urban population centers are growing, and as they grow, local services and supplies now purchased outside the region as the basis for new local business starts.

Tourism and Recreation

Tourism and recreation are big business in Kentucky. Estimates prepared for the Kentucky Department of Public Information indicate that out-of-state visitors spent \$205 million in Kentucky for recreation and vacation travel in 1966.

Four locations in Appalachian Kentucky have characteristics that make them appropriate locations for terminal tourist complexes (large scale overnight accommodations and a broadly diversified recreation program). These are:

- * The Big Sandy Area - this is the area around the proposed Yatesville and Paintsville Reservoirs, plus the existing facilities at Jenny Wiley State Park.

- * London-Corbin Area - This area includes Cumberland Falls and Laurel Reservoir in conjunction with the heavy north-south year-round tourist traffic on I-75.

- * The Cave Run Area - This is a proposed special recreation area on I-64 and the Cave Run Reservoir. A special feature will be the creative arts programs to be established on a lakeside campus by Morehead State University.

- * The Lake Cumberland Area - This is the area around Lake Cumberland. The initial terminal complex can be developed in the Somerset-

Burnside area. Upon completion of Appalachian Corridor J, Celina Reservoir and the proposed Kentucky Route 61 improvements, the Albany-Burkesville area will become the larger complex, enhanced by the present Dale Hollow facilities and Center Hill Reservoir in Tennessee.

Less extensive and seasonal areas complement these terminal complex areas. These include:

- * Breaks Interstate Park
- * Berea and Renfro Valley on I-75
- * Blue Licks Battlefield State Park
- * Buckhorn Lake State Park
- * Carter Caves State Park
- * Cumberland Gap National Historical Park
- * Fishtrap Reservoir
- * Fort Boonesborough State Park
- * General Burnside Island State Park
- * Grayson Reservoir
- * Green River Reservoir
- * Greenbo Lake State Park
- * Kingdom Come State Park
- * Lake Cumberland State Park
- * Levi Jackson Wilderness Road State Park
- * Little Shepherd Trail through Pike, Letcher, Harlan, and Bell Counties
- * Natural Bridge State Park
- * Pine Mountain State Park

Related tourist attractions outside the area but affecting its tourist trade area are:

- * Old Fort Harrod State Park
- * The Lincoln Birthplace National Historic Site, Mammoth Cave National Park, My Old Kentucky Home State Park, and numerous pioneer and Lincoln shrines to the west
- * The Lexington area horse farms
- * Tennessee recreation areas to the south

The tourism and recreation program for Appalachian Kentucky has two strategic dimensions. The first is the interrelationship between the tourist recreation facilities and local recreation facilities program. The second is the development of the regional program on the basis of three major units and construction of reception areas at critical points of entry to Kentucky at Lexington, Maysville, Catlettsburg, and Elizabethtown. These systems, the staging area locations, highways, terminal complex areas, and seasonal or smaller areas are shown in Figure 2. The map (Figure 2) in its present form is merely a preliminary sketch of the pattern toward which the tourism and recreation facilities system in Appalachian Kentucky could evolve. At present, application has been made to the Economic Development Adminis-

tration for a research grant to analyze the potential of the area and design a recommended system in greater detail.

An important element in the development of the Kentucky tourism program is the tourist staging area. These facilities would consist of an information center and extensive overnight camping and lodging facilities. Information would include location, facilities description, fees and regulations at every tourist attraction in Kentucky; advance reservation services; road condition and detour information, and summer theater or special program details. The function of the staging area would be to encourage the tourist to stop and catch his breath, and while stopped to simply and tastefully welcome him to the state and sell him on the idea of spending more of his time and money in Kentucky. The Lexington site is appropriate for several reasons. It is at an intersection (I-75, I-64) of two major cross-country highways entering Appalachia. The Lexington area, with its horse farms and historical points of interest is in itself attractive. And, there is no well publicized place nearby where a camper may stop overnight. The Catlettsburg and Maysville locations could be developed with attractive riverside camping areas. It is suggested that the state "go first class" on these three staging areas and the quality of supporting and component services. The Elizabethtown facility is needed not only to serve the Lake Cumberland complex but also western Kentucky tourist complexes.

The remaining element in the strategic development of the tourism and recreation industry in Appalachian Kentucky is establishment of a tourism and recreation development authority or corporation capable of planning, constructing, managing, leasing, and promoting tourism facilities in eastern Kentucky. This agency should have state or regionwide jurisdiction because of the magnitude of the financing involved.

Housing

In Appalachian Kentucky, 91,319 dwellings out of a total of 267,901 were sound structures with all plumbing in 1960. Over 61 percent of all dwellings were built prior to 1939. Estimates by Spindletop Research indicate an annual demand for 1,672 homes valued at \$13,000 or above, plus annual demand for 5,210 units of low income private and public housing and 513 vacation homes. In addition, there is a considerable backlog of repair and replacement of existing substandard homes.

Reasons for the substantial amount of poor housing in Appalachian Kentucky include:

- * Inadequate credit sources, especially for low income housing and speculative building

- * Lack of skilled construction workers

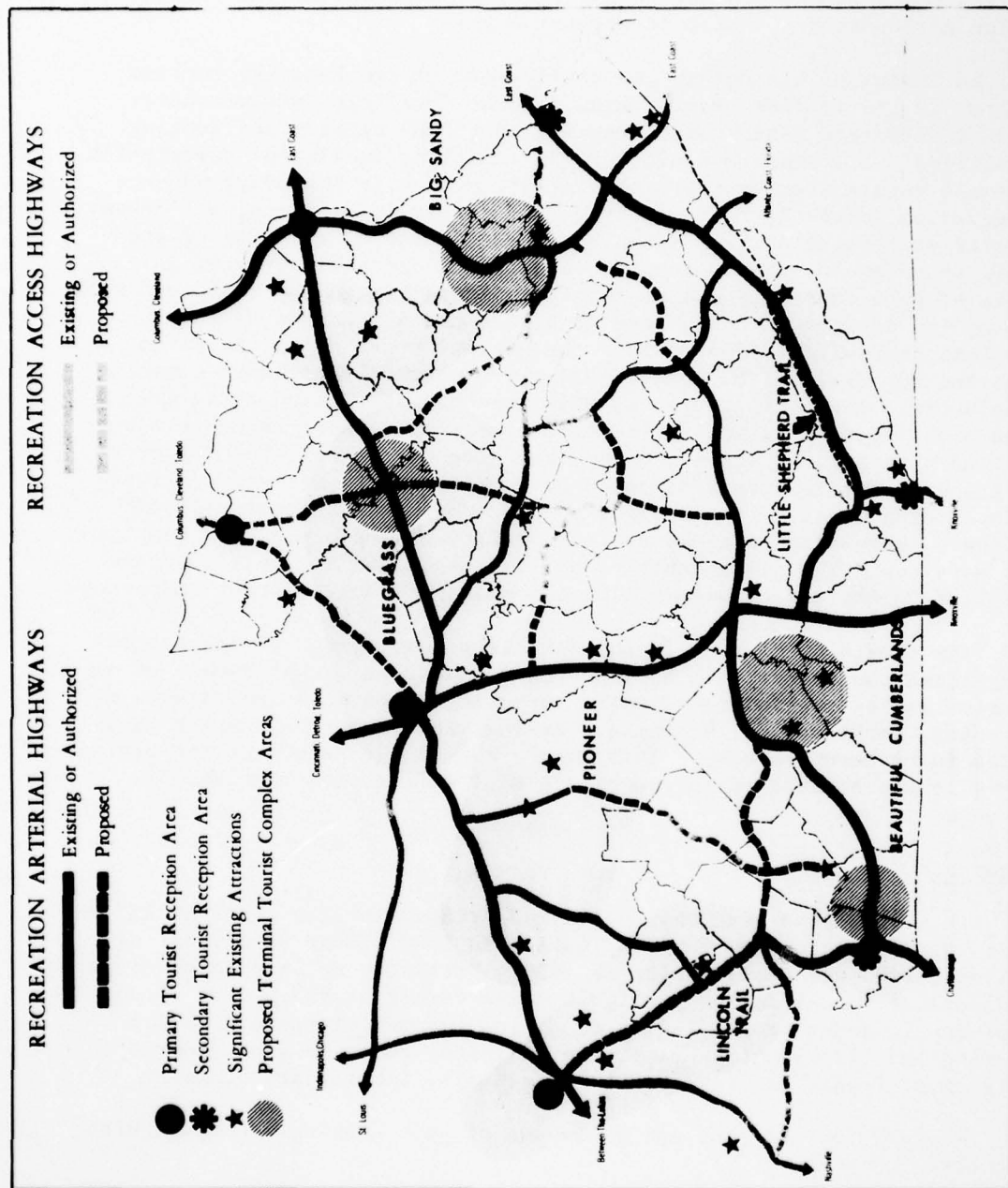


Figure 2. Preliminary Schematic,
Tourism and Recreation Program--Appalachian Kentucky

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CORPS OF ENGINEERS CINCINNATI OHIO
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
APR 69

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* High materials costs

* Unwillingness to assume large debts, especially by older persons

A program for improvement of housing in Appalachian Kentucky can be aided considerably by establishment of a state or regionwide development corporation to function as a state or regional housing developer. At present, a prospectus for such an organization is being drawn up by Urban America, Inc., retained for the purpose by the ARC.

The 1967 amendments to the Appalachian Regional Development Act added Section 207. Under Section 207, the Secretary of the Department of Housing and Urban Development is authorized to make loans up to 80 percent of preliminary costs of planning a project and obtaining an insured mortgage under Section 221 of the National Housing Act. Technical assistance grants would also be authorized to cover costs not recoverable under the mortgage contracts.

Education and Health

Education. The educational process in Appalachian Kentucky is conducted by several systems including public education, vocational education, college and junior college systems, the complex of mental health institutions, and the current adult basic and preschool education programs funded by the Office of Economic Opportunity.

As stated previously there has been an initial heavy commitment to vocational education and ETV under the provisions of the Appalachian Development Act. The completion of these systems will provide nearly complete coverage of Appalachian Kentucky.

The statistics related to the public education system in Appalachian Kentucky indicate the following:

* Average school years completed by persons over 25 years of age in 1960 ranged from 7.6 in the Middle Kentucky River Development Area to 8.7 years in the Fivco Development Area.

* Elementary school teachers' salaries in the 1965-66 school year averaged \$4,450 in Appalachian Kentucky; \$4,883 for the state. High school teachers' salaries average \$4,800 in the region; \$5,243 in the state.

* Financial support was drawn from local, state, and federal sources as shown in Table 4. Table 4 shows that county public school systems in Appalachian Kentucky have received a considerably greater proportion of their money from state sources than either Appalachian Kentucky independent school districts or the state as a whole.

* Revenue investor per child in 1965 is shown in Table 5. The data in this table shows that the local support for education in Appalachian Kentucky was \$66 less per child and state support was \$34 more.

Table 4

FINANCIAL SUPPORT FOR EDUCATION--1965
APPALACHIAN KENTUCKY REGION

	<u>Appalachian Counties</u>	<u>Appalachian Independent</u>	<u>Appalachian Region</u>	<u>State</u>
Local	17.8%	37.8%	21.6%	38.6%
State	76.0%	59.3%	72.9%	56.7%
Federal	6.2%	2.9%	5.5%	4.6%
Total	100.0%	100.0%	100.0%	100.0%

* In Appalachian Kentucky 57.5 percent of the ninth grade entrants continued school to graduate in 1964. For the state, 63.5 percent finished high school.

* From 1962 to 1964 an average of 33.4 percent of Appalachian Kentucky high school graduates enrolled in college compared to 39.3 percent for the state.

In short, when Appalachian Kentucky is compared with the state, teachers are paid less, the school districts spend less per child, local support is less, state support is higher, fewer ninth grade entrants graduate, and fewer graduates go on to college.

This information is not new or startling. The long-term under investment in education in Appalachian Kentucky is well recognized.

Table 5
Average Revenue for Education
Per Child--1965

	<u>Appalachian Kentucky</u>	<u>State</u>
Local	\$ 69	\$135
State	232	198
Federal	17	16
Total	\$318	\$349

There is serious question, however, as to the best way to correct the situation. The initial heavy investment in vocational schools attacks the immediate problem of increasing the capability of those currently entering the work force or who, with added training, could enter the work force. Finding a solution to the basic problem of financing and improving the entire educational systems of Appalachian Kentucky is a far more complex

problem. It is asserted that the attitude of the community toward the worth of education is a basic factor not only in the level of financial support but also in the performance of the educational system at a given level of support. Given this attitude, the next question facing the community is what it expects its educational system to do, thus, opening up a wide ranging dialogue on what is happening to its local graduates, the adequacy of facilities, faculty, and administration, and most importantly, how one judges whether a school system is doing its job. Finally, beyond certain bounds, the balance of society will intervene in the local educational process when the process causes trouble elsewhere, i.e., an urban Appalachian ghetto in Chicago, Detroit, or Cleveland with its attendant problems. With this intervention comes financial support, and with the financial support comes a set of external attitudes, educational goals, and a demand for results measured on a scale of externally determined standards. This intervention usually will not be overt, or sudden, or a conscious act; it simply happens.

The choice facing the community is rather clear. Either the local communities in eastern Kentucky will determine how they will go about funding and operating a local system adequate with respect to that part of the rest of the nation that its young people affect, or goals will be set, funds supplied, and performance required by state and federal institutions. The statement on performance is further complicated by the fact that there is little agreement on how to measure the performance of a school system. Whether or not the community choice is a conscious and calculated act, the choice will be made. The usual mechanism is the community's decision as to the level of local tax support for the educational system.

When one analyzes the local school data in Appalachian Kentucky, low dropout rates are related to high local financial support. This is not to say that one causes the other. They both may simply reflect a higher income community which places a higher value on education and is willing to pay for it. On the other hand, low dropout rates are not necessarily related to higher than average revenue per child, which at least raises the question of whether merely increasing the financial support of the school system is enough.

Significant improvement of public school systems in eastern Kentucky depends on the degree to which the people of the region, with the encouragement of professional teachers associations and the state colleges of education, probe the question, decide on a course of action, and commit money and people to that course of action. The suggested beginning point is a local inquiry by each community into what has happened to its recent graduates and whether or not their situations could have been improved by changes in the local public school systems.

For the present, the needs of institutions of higher education in Appalachian Kentucky are those of growing institutions of this kind everywhere. In Appalachian Kentucky, however, there is a special need

for development of two-year terminal professional programs at the college level. These programs are especially critical with respect to training of managerial talent to supply manpower to the program of industrial and business expansion.

Health. A principal problem in achieving the manpower development goal in eastern Kentucky is that of providing comprehensive health care services to a population dispersed over rough terrain. The adequate provision of such services is not a problem unique to Appalachian Kentucky, but the added difficulties imposed by terrain and distance add to the challenge. The types of service included in the term "comprehensive" include:

- * Acute and emergency care
- * Supportive services for the chronically ill who are not in institutions
- * Institutional long term or extended care
- * Community health services
- * A medical program aimed at improving environmental conditions which jeopardize health

The provision of coordinated systems to supply each of these services and a balance and coordination of all services are the objectives of the Southeastern Kentucky Regional Health Demonstration Project submitted by several health agencies in Kentucky under the provisions of Section 202 of the Appalachian Regional Development Act. The experience gained from this project should provide the basis for substantially improved health services in Appalachian Kentucky.

A final point needs emphasis. At this time, in the development of health and education facilities in Appalachian Kentucky recent completions, current construction, and authorizations will in most areas satisfy those situations where it is necessary to take basic facilities to the people to be trained. In the future increasing recognition should be given to the fact that health and education facilities are basic components of the package of community facilities necessary to attract industry and meet the Appalachian Kentucky urban service goals. The placement of health and education facilities in the future should increasingly reflect the role of such facilities in enhancing a community.

Water Resources Utilization

The management of water resources in Appalachian Kentucky is a most vital element in overall development programming. The relatively high

annual rainfall (over 40 inches) coupled with a terrain notable for its narrow valleys has led to frequent flooding and severe damage to many communities. It has also prevented use of valley floors for industrial site development.

At the same time Appalachian Kentucky has also had water supply problems. The region is not noted for its underground aquifers although many towns are adequately served by wells. Water supplies for major water-using industries and streamflows necessary for pollution abatement are generally inadequate.

The general solution to this problem has been the construction of several large controlled water impoundments which are designed to pool surface water and release it on a schedule designed to serve water supply needs.

Under the provisions of Section 206 of the Appalachian Regional Development Act, the U.S. Army Corps of Engineers has been engaged in a survey of the water resources of the entire Appalachian Region. One of the concepts that has emerged from this activity has been that of expansion benefits; that is, benefits in the form of increased personal income, that accrue as a result of downstream development made possible by a water control structure. The specific calculation of such benefits has been the subject of a pilot study of the Royalton Reservoir project in Magoffin County. If validated, this will substantially modify the pattern and level of future reservoir construction in Appalachia.

Another problem, however, has become apparent and neither the Corps of Engineers nor the Soil Conservation Service of the U.S. Department of Agriculture is currently addressing itself to it. In the Tug Fork of Big Sandy Valley, the Triplett Creek watershed in Rowan County and at the headwaters of the Cumberland River, especially along Poor Fork, existing development of the main stem valley floors makes cost of construction of main stem water control structures prohibitive. Furthermore, it would require shutting down new and active coal mining and curtaining the substantial current employment that it supports. As yet no system of controlled smaller structures on tributaries has been designed to replace main stem dams. There are serious engineering problems; there are numerous a priori arguments as to why a system of smaller impoundments will not work.

The availability of the Midlands floodplain for full industrial development, the release of land necessary beyond 1975 for continued industrial growth in the Cumberland Valley Development Area, and alleviation of local flooding conditions in Tug Fork and similar areas in Kentucky, West Virginia, Tennessee, and Virginia, all could benefit from exploration of this small impoundment question.

Land Resources Utilization

The gross changes in land use in relation to agriculture have been cited under "Developmental Strategy." These gross moves, however, tend to conceal the intense competition in some areas for the very limited supply of developable land. Employment projections, if translated into land needs at the rate of 200 acres per 1,000 new jobs, point to acute land shortages in the Cumberland Valley and Kentucky River Development Districts.

The land shortage problem in the Kentucky River Development District, especially the Upper Kentucky River Development Area, is the result of an absence of level land in the area, flooded or not. And most of it floods. The new Carr Fork Reservoir, even if supplemented by the proposed structure at Blackey or Ulvah, does not solve the flood problem for the town of Hazard. Increasing the amount of developable land in this area rests on devising ways of utilizing the hillsides and strip mine benches, or land leveling projects in conjunction with an increase in flood control structures. The critical point here is whether to sustain the high cost of such structures or plan for continued outmigration.

The land problem in the Cumberland Valley area is the flooding of rather extensive bottoms along the Cumberland River. The usual flood control dams cannot be built in the larger valleys, because this involves relocation of highways, railroads, utilities lines, and numerous homes. Dams would also flood out coal mining operations. The solution to this problem lies in either extensive local protection levees or a solution to the problem of how to use smaller controlled impoundments in unoccupied hollows to achieve flood control as outlined under "Water Resources Utilization."

In the remainder of Appalachian Kentucky, the major use of land is in agriculture and forestry. Programs dealing with the orderly expansion of these industries will contribute to effective land use.

Timber Resources Utilization

In the Appalachian Kentucky Region, 66.4 percent of the total land area is commercial forest. Of this, 3.6 million acres are in sawtimber. The net annual desired cut of sawtimber consists of 31.1 million board feet of softwood concentrated largely in the southern part of the region, and 417.8 million board feet concentrated in the Central Appalachian development districts.

Major conservation problems include improvements of timber stands, and protection from fires, insects, and disease. Generally, the most valuable species are overcut, and the less valuable species undercut, with respect to net annual desirable cut. The pressing problems are

increased utilization of less valuable species, reforestation to increase the eventual supply of more valuable species, and timber lands management that will not only serve these objectives but integrate forest area management with water resource management and recreation uses.

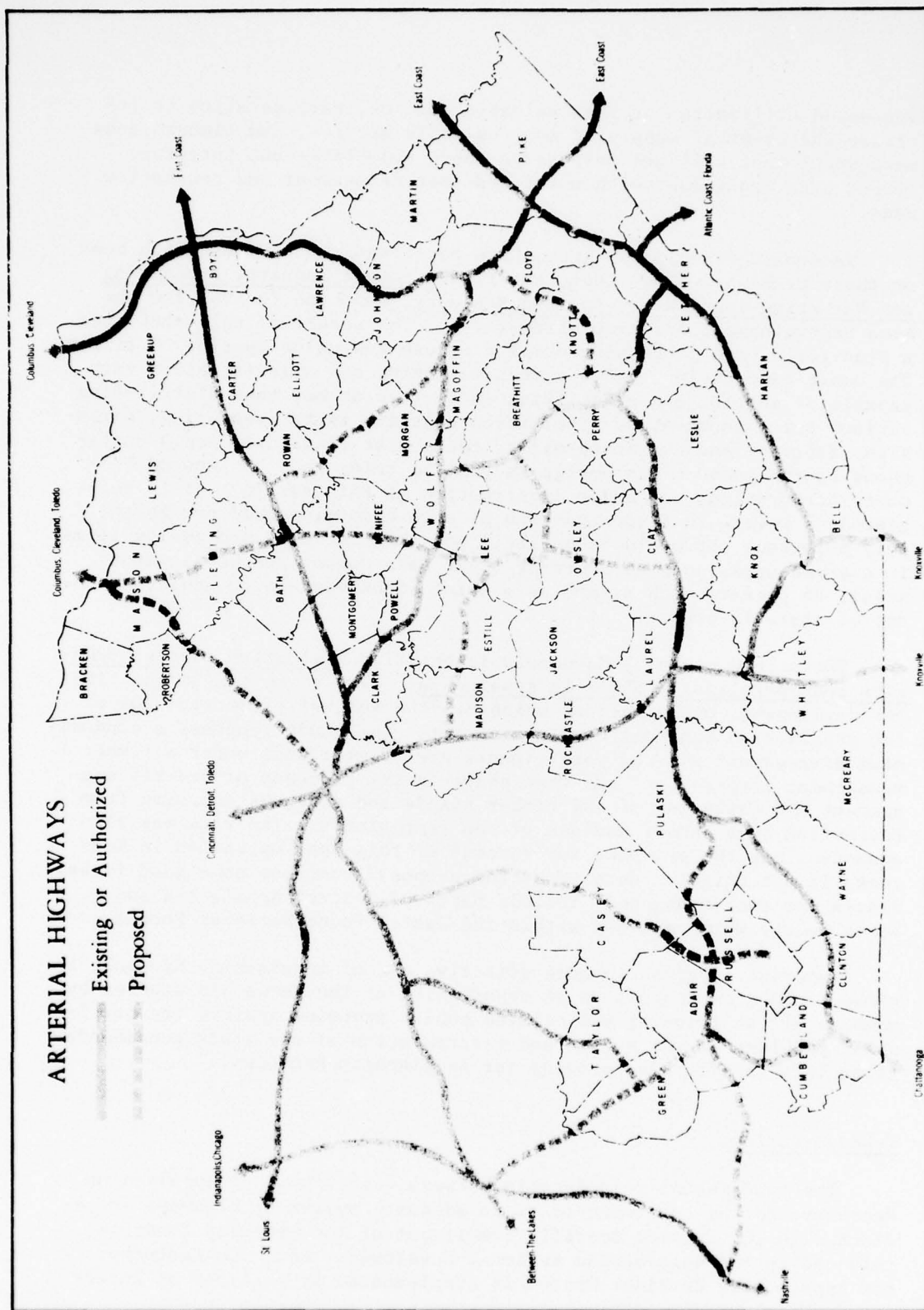
Macdonald Associates, Inc., have performed two studies which bear on these problems. The first, entitled A Forest Industry Processing and Marketing Complex for Eastern Kentucky, was done in 1963 for the Area Redevelopment Administration (ARA). The result of this study was a plan for a wood processing complex to use low-value species of timber. The basic concept involved a timber receiving and classification yard capable of sorting and classifying whole tree stems, then distributing various parts to numerous satellite processing units (veneering, dimension, flooring and chipboard mills, fence post treatment, etc.) contiguous to the yard. This design is the one being used by Kenwood Products Corporation, now under construction at Paintsville. It is suggested, however, that construction of such complexes need not be the only solution. It would be entirely possible for wood processing firms in a given area, such as Somerset (East Lake Cumberland Development Area), to operate such a yard as a joint stock venture to achieve economy of scale in procurement.

The second study by Macdonald is entitled Evaluation of the Formation and Operation of TDO's in Appalachia. "TDO's" refers to the timber development organizations which are the subject of Section 204 of the Appalachian Regional Development Act. The study proposes a condominium arrangement whereby participants pool timberlands under a timber management corporation, and then share in the proceeds of orderly management and marketing of the timber stands and revenues accruing from recreation development and use of the timberlands. The view was also advanced that the prospect for success of this type operation in Kentucky is not bright. Here, too, the proposal contains some good ideas. Places for such management include parts of Central Appalachia and Lewis County which are not within the Daniel Boone National Forest.

Material progress in more effective use of Appalachian Kentucky's timber resources depends on an examination of the Macdonald studies by members of the industry and related public agencies against the particular problems of the region and reformulation of the study recommendations into an effective program for Appalachian Kentucky.

Transportation

The fundamental relationship between development of Appalachian Kentucky and the construction of an adequate system of highways is reflected in the initial specific commitment of the majority funds to this end in the Appalachian Regional Development Act. In Kentucky, the Appalachian Corridor System is supplemented by portions of Inter-



state highways I-64 and I-75, the substantial improvement of U.S. 25E from Corbin to Middlesboro, and most recently, the authorization of construction of a state sponsored toll road from London to Hazard. This system, when completed, will greatly reduce the isolation of eastern Kentucky which is responsible for many of its problems.

In addition to this basic system there is authorization for an access road program. Further, in three development areas additional roads are proposed which are strategically related to area development programs and which also tend to fill out the basic corridor act. These supplemental roads are described in the area discussions in the appendix and shown as broken lines in Figure 3.

Taken together, however, each of the access roads and supplemental road systems proposed have implications for the region as a whole. These system features can be listed as follows:

- * The summation of the Big Sandy, Cumberland Valley, and Lake Cumberland Development District programs for highway construction provides for completion of Kentucky 80 from New Allen to Bowling Green, Kentucky. The only piece missing, and hence justifiable, is the section from Garrett to Hindman. The remainder is either authorized for construction as a toll road (Hazard to London), part of an Appalachian Corridor (London to Somerset), or part of an area access or development system.

- * The combination of access roads to serve the Midlands area with the Maysville-Flemingsburg link, and a short section from Frenchburg to Slade combines programs for the Buffalo Trace and Gateway Development Areas. Extension to the north as a supplemental Appalachian Ohio highway and extension to the south to Manchester would provide a supplementary tourist access road to interior points in the Appalachian plateau from population centers to the north. It would also provide additional access to Beattyville, Booneville, and Manchester, opening up bottomlands below the proposed Booneville Reservoir for more intensive use.

- * Combination of the programs for the Foothills and Middle Kentucky River Development Areas provides for linkage of Richmond, Irvine, Beattyville, Booneville, and Jackson, providing better truck access to complement existing rail service, thus, enhancing these towns as sites for expanding industry.

V. URBAN SERVICE AREAS

The preceding discussion of strategic factors influencing the development of the Appalachian Kentucky Region deals substantially with those policies directed at income, natural resources, and human resource development goals. To deal more adequately with transportation and urban service goals, however, it is necessary to begin to delineate

where growth in terms of the Appalachian goals may be expected to occur and where placement of urban service facilities will most effectively accelerate the realization of adequate service levels.

Figure 4 shows the present situation in transition. The following definitions convey the meaning of the classifications shown on Figure 4.

Metropolitan Service Center. A major urban concentration providing central banking, regional wholesale distribution, regional higher and vocational education, and origination of regional daily newspaper coverage and television (TV) broadcasting. The only such center in Appalachian Kentucky is the Ashland-Huntington tri-state area. Lexington, Knoxville, and Cincinnati also serve portions of the region.

Existing Urban Service Centers. Full service urban places with competitive retail and wholesale firms and competitive banking facilities. Although growing, they present a balanced range of services to their hinterlands and display a diversified industrial base. These existing centers are complemented by smaller satellite communities, often across county lines.

In Appalachian Kentucky Development Districts, these centers are:

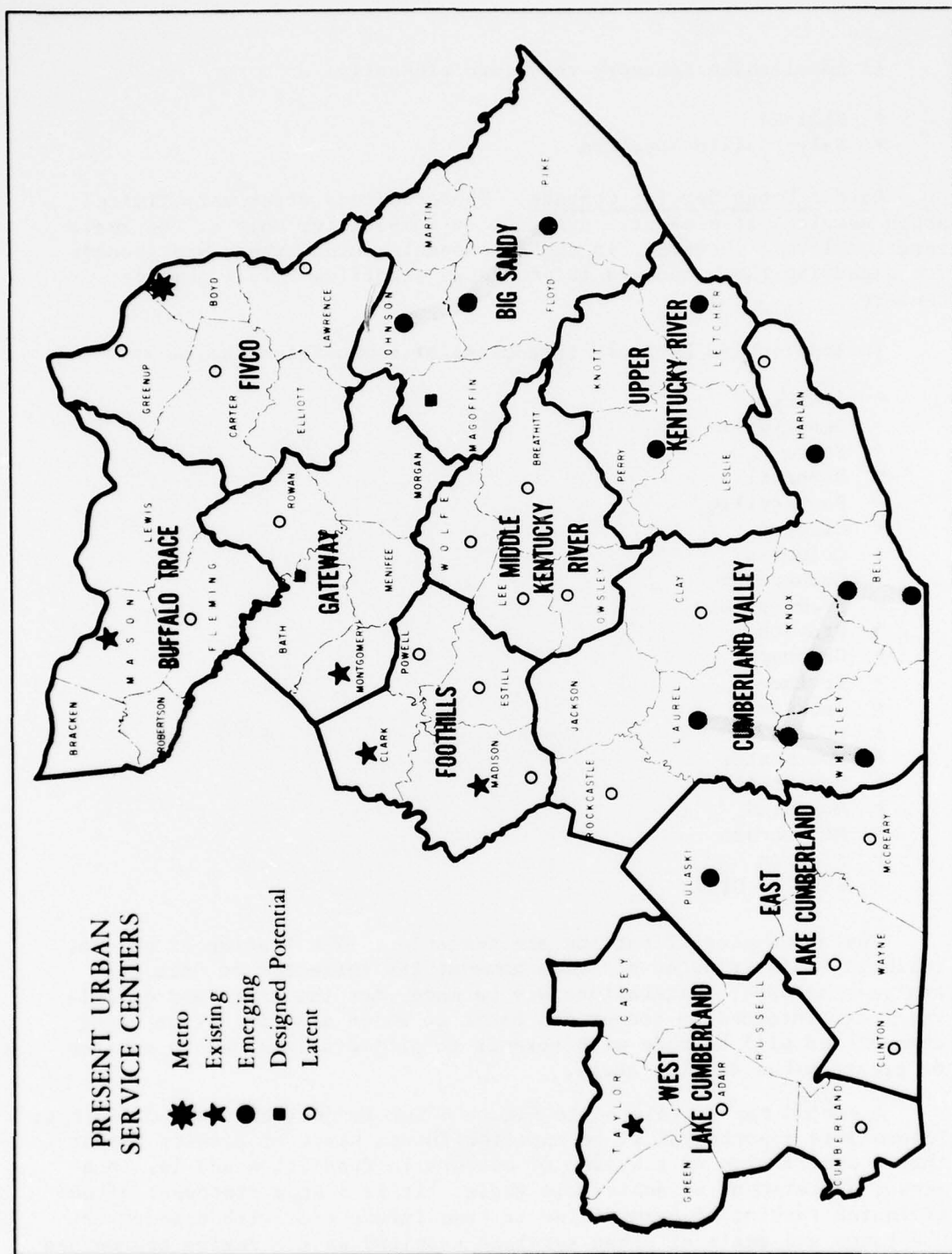
- * Campbellsville
- * Maysville
- * Mount Sterling
- * Richmond
- * Winchester

Emerging Urban Places. Places which present an incomplete complement of urban services to their hinterlands relative to existing demands placed on them. There is lack of competition in selected areas of business or banking, and a lack of diversity in its manufacturing base.

In Appalachian Kentucky these points are:

- * London-Corbin-Williamsburg
- * Harlan
- * Hazard
- * Middlesboro-Pineville-Barbourville
- * Pikeville-Prestonsburg-Paintsville
- * Somerset
- * Whitesburg

Designed Potential Urban Service Centers. Areas where services may be currently limited or even nonexistent but where programmed development indicates that, by design, full service urban service centers can and will likely be created.



In Appalachian Kentucky these are presently:

- * Midland
- * Salyersville-Royalton

Latent Urban Service Centers. These centers offer very limited urban services at present. Business is competitive only at the small retailer level. However, in the foreseeable future there are grounds for expecting these centers to emerge as significant full service centers.

In Appalachian Kentucky this class of communities includes:

- * Albany
- * Beattyville
- * Berea
- * Booneville
- * Burkesville
- * Campton
- * Columbia
- * Cumberland
- * Flemingsburg
- * Grayson
- * Greenup
- * Irvine
- * Jackson
- * Louisa
- * Manchester
- * Monticello
- * Morehead
- * Mt. Vernon
- * Stanton
- * Witley City

The above classifications are tentative. The listing at present reflects the attributes of these communities reflected in data and analysis at hand. Alterations may be made, but the lists and definitions are intended to convey the basis on which discrimination among communities will be made with respect to projects intended to enhance or create urban service areas.

A second map is related to Figure 4 but is qualitatively different. Figure 5 is a portrayal of an expected future state of affairs rather than a description of a system of centers in transition and is, in a sense, a statement of achievable goals. It is also a statement of anticipated ranking of communities at some future time with respect to the range and scale of urban services supplied as the region approaches or catches up to the rest of the nation.

The evolution of the situation portrayed in Figure 4 into that portrayed in Figure 5 is conjectural but based on certain existing characteristics of urban places and events of developmental importance now occurring.

No change is expected in the identity or range of influence of the major metropolitan centers serving Appalachian Kentucky. Furthermore, no further metropolitan centers are expected to develop within Appalachian Kentucky. Therefore, the attainment of adequate levels of urban services will be achieved in the context of existing topography and settlement patterns by emergence of a hierarchical system of urban service centers. The ordering of the hierarchy will recognize the scale of service required by the efficient functions of the facility necessary to provide the service, the dispersion of the population to be served over the life of the facility, and placement according to convenience, system strategy, and other criteria discussed in preceding sections of this document.

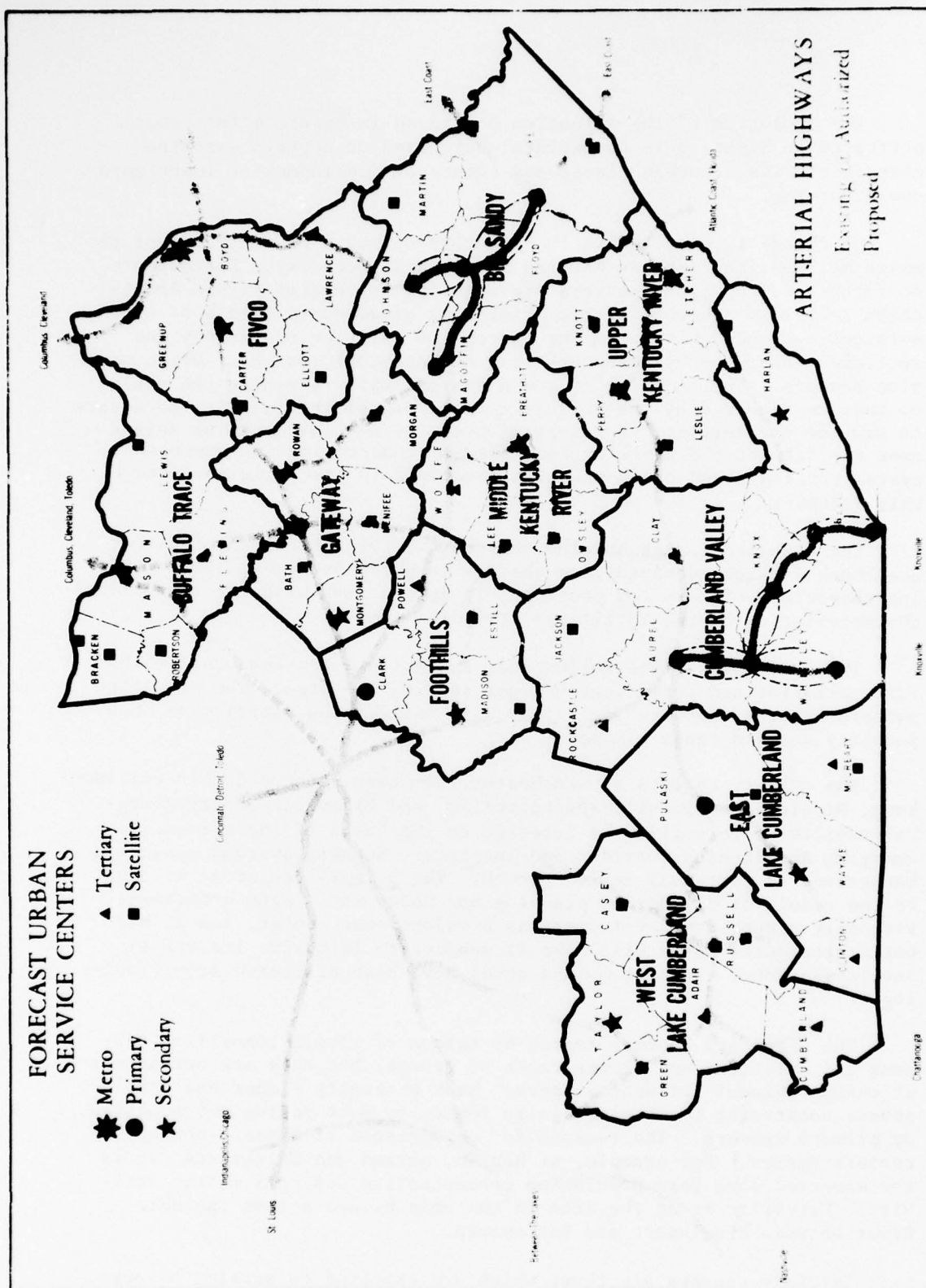
The cohesive forces holding the urban service hierarchy together are those linkages derived from the way in which people go about availing themselves of services provided, in interaction with the operational characteristics of the facilities providing them.

These linkages often follow and, in fact are the reasons for the transportation and communications net serving the area. The resulting pattern of urban service facilities will reflect the capacity of each facility and its range of impact.

The primary centers at Winchester, Somerset, London-Corbin-Williamsburg, Middlesboro-Pineville-Barbourville, and Pikeville-Prestonsburg-Paintsville-Salyersville are forecast on the basis of the currently emerging Appalachian Corridor and Interstate Highway Systems against a background of currently active growth. The primary center at Midland is the result of deliberate planning now under way. Firm commitments virtually assure its development as a major urban center, and it has basic attributes which will make it subject to intensive industrial development once the bottom land acres have been protected from flooding.

The secondary centers emerge by reason of single compelling reasons for existence and slower rates of growth, but they are not points at which regional influences focus. Each generally either has some severe constraint or is essentially remote to more active metropolitan or primary centers. The reasons for persistence of these secondary centers varies. For example, at Harlan, Hazard and Whitesburg, it is the expected long term population concentration and coal mining activity. Maysville is at the site of the only bridge across the Ohio River between Cincinnati and Portsmouth.

Tertiary centers are those which are expected to persist because



they are important satellites or county seat towns offering substantially more than mere county government services.

Satellite communities are those with some single reason to persist such as their status as a county seat or presence of some focal point of activity, i.e., Berea College. However, satellites are considered to be an integral component of some larger urban service area, and investment decisions will reflect their contribution to the larger complex of which they are a part.

An example will demonstrate how maps of this type serve to evaluate a project. Suppose, for instance, that an application is received for federal and state funds for a medical facility to be located at Hindman, Kentucky. This community is the county seat of Knott County located 20 miles northeast of Hazard, Kentucky, along Kentucky Highway 80. Hindman is currently classified as a satellite community related to Hazard along with Hyden, the county seat of Leslie County 22 miles southwest of Hazard on Kentucky 80.

A basic question would involve the minimum scale of an adequate facility of the proposed type. If the minimum desirable size is such that only one could be reasonably expected to be placed in the entire area served by Hazard, then location at Hindman would have to demonstrate that services are also available to Hyden or the facility would be located near or in Hazard. On the other hand, if scale considerations indicate that a smaller facility is efficient, the Hindman facility would be approved on condition that a commitment is made to construct a similar facility at Hyden and such other places appropriate to supply similar services to the whole area. Thus, the criterion for placement is the contribution of the project to area and regional development goals within a comprehensive program.

The function of Figure 4 in this exercise is to show the centers and boundaries of present service areas. This gives some background for evaluating the near-term use of a given facility. Figure 5 is both a forecast of the rank of future centers and a goal. It provides the background for evaluating the contribution of projects of given scale toward reaching area urban service goals.

Such maps (Figures 4 and 5) are intended to be a flexible basis for arriving at reasoned decisions in locating urban service facilities. Another illustration will demonstrate their use. Suppose a facility is to be located of such character that only one can be supported in the Appalachian Kentucky Region, and its use dictates that people from all over the region frequently travel to it by auto. The Appalachian and Interstate Highway Systems under development would direct that such a facility be placed in the Lexington area near convergence of I-75, I-64, and the Mountain Parkway. If another type of service would permit two facilities, with the same visitation characteristics, then locations like Winchester (convergence of I-64 and Mountain Parkway)

and London or Corbin (central to the I-75 leg) would be indicated. Given a type of facility with heavy visitation and a scale factor permitting three units, then perhaps London or Corbin (central to I-75 and U.S. 25E), Campton (convergence of Appalachian Corridors I and R), and Midland (central to I-64) would be indicated. The latter two placements would contribute to the development of a currently latent center (Campton) and designed potential urban service center (Midland) and lend support to other projects contemplated for such currently undeveloped centers. If the specifications of the proposed facility were such that its use was not highway dependent, such as a resident educational facility, then even greater use could be made of such a facility to stimulate design potential of latent centers, if and only if, commitment is made to provide a substantial package of other projects. This would be especially true of a large regional facility.

This exercise should illustrate that the maps can serve as the basis for thinking through the implications of alternative locational strategies, without losing the creativity permitted by flexibility. The illustration admits the possibility that strategic placement of a facility in a latent area, if accompanied by vigorous and imaginative leadership, could substantially alter the locations where primary or secondary urban service areas could develop. On the other hand, some cognizance must be taken of the very real constraints on some communities, such as lack of developable land, which means that much greater effort and expense will go into achieving the same level of services which could be provided from places with fewer constraints.

Listing of Forecast Urban Service Centers by Hierarchial Level

- Big Sandy Area - 1965 Estimated Population - 138,100
Primary - Paintsville-Prestonsburg-Pikeville-Salyersville
Satellite - Elkhorn City, Inez, South Williamson
- Buffalo Trace Area - 1965 Estimated Population - 51,700
Secondary - Maysville
Tertiary - Flemingsburg
Satellite - Augusta, Brooksville, Mt. Olivet, Vanceburg
- Cumberland Valley Area - 1965 Estimated Population - 197,600
Primary - London-Corbin-Williamsburg; Middlesboro-Pineville-Barbourville
Secondary - Harlan
Tertiary - Manchester, Mt. Vernon
Satellite - Cumberland, McKee
- East Lake Cumberland Area - 1965 Estimated Population - 70,500
Primary - Somerset
Secondary - Monticello
Tertiary - Albany, Whitley City
Satellite - Burnside, Stearns

Fivco Area - 1965 Estimated Population - 119,300

- Metro - Ashland
- Secondary - Grayson
- Tertiary - Greenup, Louisa
- Satellite - Olive Hill, Sandy Hook

Foothills Area - 1965 Estimated Population - 80,600

- Primary - Winchester
- Secondary - Richmond
- Tertiary - Stanton
- Satellite - Berea, Irvine

Gateway Area - 1965 Estimated Population - 52,300

- Primary - Midland
- Secondary - Morehead, Mt. Sterling
- Satellite - Frenchburg, Owingsville, West Liberty

Middle Kentucky River Area - 1965 Estimated Population - 30,600

- Secondary - Jackson
- Tertiary - Campton
- Satellite - Beattyville, Booneville

Upper Kentucky River Area - 1965 Estimated Population - 92,500

- Secondary - Hazard, Whitesburg
- Satellite - Hindman, Hyden

West Lake Cumberland Area - 1965 Estimated Population - 70,800

- Secondary - Campbellsville
- Tertiary - Burkesville, Columbia
- Satellite - Greensburg, Jamestown, Liberty, Russell Springs

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 4
MARYLAND WATER SUPPLEMENT

Prepared by
Maryland Department of Water Resources

1969

I. INTRODUCTION

The Maryland Water Supplement to the Appalachian Water Resources Study is intended only to show the support of the State for studies being conducted by the several state and federal agencies under Section 206 of the Appalachian Regional Development Act. Various state technical agencies have cooperated in the planning of water control and management systems and recreation facilities which are proposed in other parts of this Report.

The keen interest in the overall ARC programs has been best said by Governor Agnew:

STATEMENT BY GOVERNOR SPIRO T. AGNEW OF MARYLAND, TO THE AD HOC SUB-COMMITTEE ON APPALACHIA OF THE PUBLIC WORKS COMMITTEE OF THE UNITED STATES HOUSE OF REPRESENTATIVES. - 1967

Maryland's interest in the Appalachian Regional Development Act, which is now before the Public Works Committee for amendments, is as deep-seated as any of the Appalachian states and perhaps even greater than any other Appalachian state. Seven years ago last month the Appalachian Program had its genesis in Annapolis at a meeting of Appalachian Governors. At this meeting, the broad framework for the Federal-State approach to solving regional problems was created.

Beyond this very basic, long-standing interest in the program, Maryland has benefited considerably from the program in the two years since it was enacted into law by Congress.

To date, we have made use of, or plan to commit during this fiscal year, a total of \$16.1 million in Appalachian funds for highways, vocational education facilities, a regional health center, hospital additions, sewer projects, community college construction, a library and others. The highway money has been earmarked for construction of an inter-regional highway which will provide the all-important connection between the great Valley of the Ohio and the ports and industries of the Middle Atlantic coast, including our Port of Baltimore. It is then that the real developmental potential of the section of Appalachia traversed by this highway can begin to be realized. The other projects enumerated, plus similar ones anticipated for the future, will also have a marked impact in enlarging the infrastructure of Appalachian Maryland.

The key appeal of the Appalachian program, beyond its objective to improve the Appalachia economy, is the unique Federal-State partnership under which the program is administered and carried out. It has worked

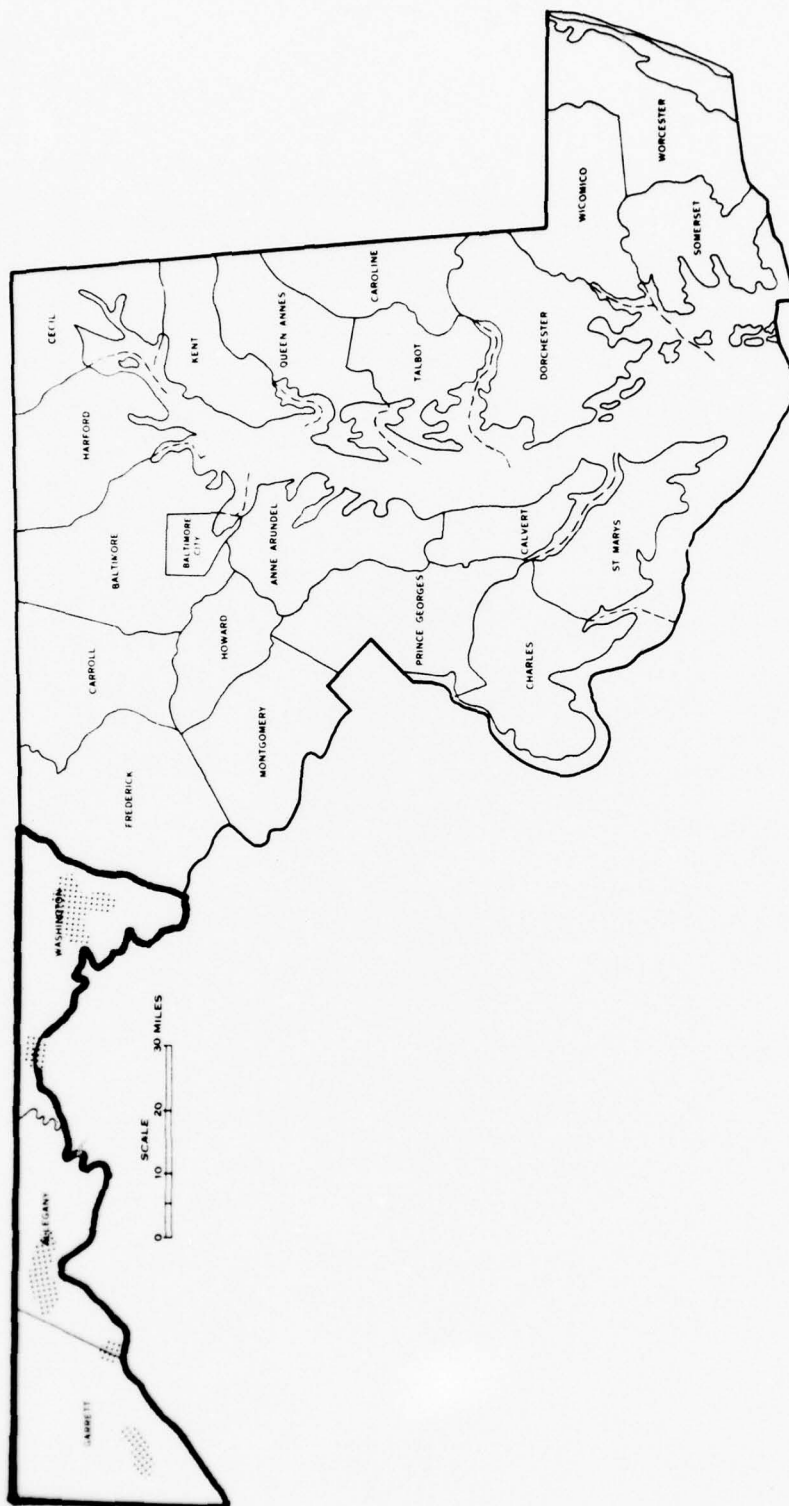
well in the operation of the Appalachian program and I believe it lends itself to expansion to other Federal developmental programs.

I believe the amendments to the Appalachian Regional Development Act that have been proposed by the Appalachian Regional Commission are necessary and proper. I especially support the amendment which would provide direct funding to the Commission - a more efficient procedure which would save time and money. I also am vitally interested in the amendment which would make the use of operating funds for demonstration health facilities more flexible so that operating funds could be made available to hospitals or health facilities that were not built with Section 202 money but which otherwise would be effective as parts of a multi-county demonstration project.

We urge your earnest consideration of the requests now before you from the Appalachian Regional Commission.

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MARYLAND



APPALACHIA

Growth Areas in Maryland

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II. MARYLAND'S APPALACHIAN REGION

Pursuant to Section 403 of the Appalachian Regional Development Act of 1965, the Counties of Allegany, Garrett, and Washington were placed in the "Appalachian Region." These three most western counties of Maryland total 1551 sq. miles, comprise about 16% of the State's land area, and contain approximately 6% of its population.

The Great Valley, geologically a projection of the Shenandoah Valley north of the Potomac River, occupies much of the eastern part of Appalachian Maryland. Between Hancock (Washington County) and Frostburg, however, the terrain is marked by high ridges and fairly narrow valleys. Just west of Frostburg, and constituting almost all of Garrett County, is the Appalachian Plateau section of Appalachian Maryland.

As a result of topography, Allegany and Washington Counties are economically oriented much more northeast-southwest than to each other. This is most clearly shown by the commuting pattern of Appalachian Maryland and adjacent counties. Hagerstown is a Great Valley city closely linked by Interstate Highway 81 to Chambersburg, about 20 miles to the north in Pennsylvania, and to Martinsburg, about 20 miles to the south in West Virginia. In Allegany County, there is relatively little local east-west traffic along U.S. 40 east of Cumberland. There is, however, heavy north-south traffic along U.S. 220 which parallels the Potomac River from Cumberland to Keyser, West Virginia on its right bank, and to Bedford on the Pennsylvania Turnpike to the north. There is also heavy traffic and almost continuous housing along State Highway 36 which follows George's Creek from Westernport to Frostburg, Maryland. However, Garrett County, situated in the Appalachian Plateau, has a much stronger east-west commuting pattern than north-south pattern.

A brief statement reviewing the economy of Appalachian Maryland is enclosed as Attachment 1. The statement was prepared by Mr. William A. Pate, Director of the Maryland Department of Economic Development, in response to questions held concerning the authorized Bloomington reservoir project on the North Branch Potomac River.

III. PLANNING FOR DEVELOPMENT IN APPALACHIAN MARYLAND

A. Federal Level

The Corps of Engineers Office of Appalachian Studies, cooperating with the Pittsburgh and Baltimore District Offices as well as with the State, are preparing a plan for the development of water and related resources in Appalachian Maryland. The plans will appear in Water

Sub-regions B and F in the final report. In that report, a detailed analysis of the economic impact of water and related resources as they affect the primary growth centers of Westernport, Oakland - Deep Creek Lake, and Hancock will be presented.

Federal programs in the planning of water and related resources in Maryland date back to the early 1800's. Programs presently active include the following:

- (1) Those provided in the Water Resources Planning Act of 1965 with its three Titles. "Title I" created the Water Resources Council; "Title II" provided for river basin commissions; and "Title III" included financial aid to state planning groups.
- (2) The Upstream Watershed Program of the USDA Soil Conservation Service set up by the Watershed Protection and Flood Prevention Act of 1954 (P.L. 83-566).
- (3) Programs of the U.S. Army Corps of Engineers, pursuant to the early navigation acts and the Flood Control Act of 1936, et. seq.
- (4) The "701 Program" set up by the Federal Housing Act, as amended in 1965, which includes grants for basic water and sewer facilities.
- (5) Programs of USDA Farmers Home Administration for loans and grants for water supply and waste disposal systems.
- (6) The Public Works and Economic Development Act of 1965 providing grants for water resources development.
- (7) The Water Quality Act of 1965 providing grants for water studies and sewage facilities.
- (8) The Land and Water Conservation Fund Act (P.L. 88-578) creating a USDI (National Park Service) program for grants for outdoor recreation areas.

B. State and Local Level

Numerous activities which will either directly or indirectly affect water resource development in Appalachian Maryland are being conducted at the State and local levels. Most of this activity has been concentrated in the Potomac Basin where the State and local governments have cooperated with the Corps (Baltimore District) and with the Department of the Interior in various basin-wide studies since the late 1950's. In addition to the basin studies, the latest of which concluded with the Interdepartmental Task Force Report in 1968, the State and counties have initiated their own planning programs. Perhaps most significant is the county water and sewerage

planning activity as described in Attachment 2. These will be supplemented by:

- (1) Planning activity utilizing Title III funds made available under the Federal Water Resources Planning Act (matched by state funds).
- (2) Basin pollution control planning under Section 3(c) of the Federal Water Pollution Control Act, as amended.
- (3) Cooperation with the SCS in the small watershed program -- in addition to participation as a project sponsor, the State also contributes financially to the planning and engineering studies of the SCS.

IV. COMMENT ON PROPOSED WATER RESOURCE DEVELOPMENT PROJECTS

A. Youghiogheny River Basin

Approximately 420 sq. miles, all within Garrett County, are in the Youghiogheny basin. This comprises 27% of the Tri-County Appalachian Maryland Area.

In preliminary drafts, the Corps' Pittsburgh District Office provided data pertaining to two reservoir sites in the Youghiogheny River Basin within Maryland: one on the upper mainstem near Crellin, the other on the Casselman River, a tributary. The dam site of the Casselman project is located in Pennsylvania, but most of the reservoir area would be in Maryland.

To date, no economic justification to Maryland can be found for the Crellin project. As a matter of fact, the Garrett County Commissioners expressed strong opposition to the project because of the economic and esthetic value of the land which would be inundated. Studies being pursued under the County Water and Sewerage Act have not indicated a need for augmented flow in the Youghiogheny. (These studies will be completed by January 1970.)

The principal development need in the Casselman River sub-basin is a water supply source for the Town of Grantsville. Consultants for Garrett County preparing the county water and sewerage plan have indicated that one of the proposed small watershed projects or a similar type project would be more suited to meet the needs of Grantsville rather than the site studied by the Corps on the mainstem Casselman. The larger site on the Casselman does have the advantage of providing a sizeable compoundment of water in close proximity to one of the Appalachia east-west corridors. The economic development potential of a site at this location should be considered prior to a decision being made.

SCS has an intensive small watershed program underway in the Little Youghiogheny basin. Five floodwater detention structures have been completed. A sixth site has been replanned to include municipal water supply storage (for Oakland and possibly other nearby communities) and recreational water in addition to sediment and flood storage requirements.

Mentioned previously were the SCS projects in the Casselman sub-basin. Five sites were investigated, including two which could provide water supply for Grantsville. One of these, site #4, is also being considered as a source of water supply for several communities within the Georges Creek watershed in the Potomac basin. Again, the selection of any of these sites must await the completion of the county planning studies.

The evaluation of projects in the Maryland portion of the Youghiogheny Basin will be supplemented by a recently authorized comprehensive basin study to be undertaken by the Pittsburgh District Office of the Corps of Engineers. Also under consideration is the implementation of either Federal, State, or a combined program which will attain "wild river" or "scenic river" status for at least a portion of the Youghiogheny River.

B. Potomac River Basin

Approximately 1131 sq. miles or 73% of Appalachian Maryland is within the Potomac River Basin.

The Bloomington reservoir project, located on the North Branch of the Potomac between Garrett and Allegany Counties, received Congressional authorization in 1963. Most recently, the Maryland General Assembly enacted legislation creating the Maryland Potomac Water Authority. This agency, comprised of representatives from the Potomac riparian counties, will be responsible for the assessment and repayment of costs to the Federal Government for water supply storage in Bloomington. The General Assembly also passed a resolution authorizing the state to pay one-third the non-federal cost of the water supply storage.

A second reservoir site in the North Branch area, Savage II, was considered by the Corps for inclusion in the Appalachia program. The Corps evaluation indicated that the project was not required to meet short-term water supply needs. However, since municipal water supply requirements continue to grow in the Cumberland area, the project may eventually be needed. The site is particularly attractive for water supply because the Savage River is one of the highest quality streams in the area. Also, Savage II would stabilize the level of an existing reservoir, thereby creating a more desirable recreation facility.

Further downstream on the Potomac, two other sites have been considered in both the Appalachia and other studies. The sites are Sideling Hill and Town Creek, both located in the Paw Paw Bends area.

These sites are for the dual purposes of downstream water supply (for the D.C. Metropolitan Area, not within Appalachia) and recreation. The State's views regarding these projects were included in the comments to the Chief of Engineers' Potomac Basin report of 1967. Town Creek was supported; however, the State asked that action on Sideling Hill be deferred. A copy of the statement expressing the State's views is enclosed as Attachment 3.

Within Appalachian Maryland, the SCS has investigated the Georges Creek and Little Beaver Creek watersheds. In the Georges Creek watershed, 5 sites were considered for flood control; none were proposed for water supply or recreation. As mentioned previously, one of the sites considered in the Casselman watershed could provide augmented flow to Georges Creek. In the Little Beaver Creek watershed, no structural measures were recommended due to the lack of suitable sites for water storage.

C. Potomac National River Legislation

Although water-oriented recreation is considered elsewhere in the Water Resources Survey, some mention should be made of the Potomac National River legislation proposed in 1968. Briefly, a Congressional bill called for public acquisition of all land between the Potomac River and the C & O National Monument lands paralleling the river for the entire distance between Cumberland and Washington, D. C. Approximately 140 miles of the river adjacent to the C & O Canal are in Appalachia; therefore, this project could be one of significance to the region.

While the State did not officially take a position on the proposal at the time, the Department of Water Resources issued a statement which raised a number of questions concerning details in the Act. This statement is included as Attachment 4.

V. MINE DRAINAGE ABATEMENT AND MINE RECLAMATION

As a coal producing state, Maryland was required to respond to Section 108 of the "Plan of Survey." This report is included as Attachment 5.

VI. SUMMARY

In the short-run analysis, water resource projects do not appear to be a major development need in Appalachian Maryland. The exception to this general observation is the North Branch Potomac area where the need for additional water supply will be met by the authorized Bloomington reservoir project. Small watershed projects now under

study will probably be utilized to satisfy immediate needs of the smaller Appalachian communities experiencing water supply problems. Project requirements over a longer planning period will be reassessed under the Youghiogheny comprehensive study, the continuing studies of the Potomac Basin, and the county water and sewerage planning program.

Water-oriented recreation is receiving considerable attention in Appalachian Maryland, although the objectives do not necessarily coincide with the goal of recreational development in the Appalachian program. The seeking of "wild river" status for the Youghiogheny illustrates this conclusion. However, the proposed Potomac National River program including the Paw Paw Bends recreational development area clearly indicate the stress being placed on improving the quality of the environment -- an objective that relates well to the economic stimulation goal for Appalachia.

ATTACHMENTS

WILLIAM A. PATE
DIRECTOR



TELEPHONE COLONIAL 8 3371

STATE OF MARYLAND
DEPARTMENT OF ECONOMIC DEVELOPMENT

STATE OFFICE BUILDING
ANNAPOLIS, MARYLAND 21401

August 1, 1968

Mr. Paul W. McKee, Director
Department of Water Resources
State Office Building
Annapolis, Maryland 21401

Dear Mr. McKee:

This is in response to your letter requesting information relative to the benefits from an economic development standpoint to be gained by construction of the Bloomington Dam, with particular regard to Allegany County.

I can assure you that these benefits will be significant since one of the basic needs of all industry is an assured supply of high quality water, which the Bloomington Dam will provide.

There are other factors, of course, which are required to create the environment needed for substantial economic growth and it is to the others that I wish to address this letter. First, however, I would like to show why Western Maryland's economic growth must be accelerated.

In the Appalachian Maryland Development Plan FY 1968, the State has said that Appalachian Maryland (Garrett, Allegany and Washington Counties) must attain an employment base sufficient to support the population and work force which resides there at a level of prosperity comparable to that of the State of which it is part. To achieve this the growth rate must exceed the national average, otherwise it would never catch up. This means that new industries must be attracted to the area and existing ones expanded.

For illustrative purposes, the general employment growth during the 1959-1965 period was as follows:

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Frederick County	29.9%
Maryland State	17.9
Allegany County	13.1
Washington County	9.2
Garrett County	7.9

Recent industrial growth patterns in employment between 1960 and 1966 were:

21% for Maryland State compared with a population increase of 17%

20% for Washington County compared with a population increase of 15%

19% for Garrett County compared with a population increase of 9%

14% for the United States compared with a population increase of 8%

4% for Allegany County* compared with a population increase of 5%

* Including Mineral County, West Virginia

Population growth projections for Appalachian Maryland are estimated as:

Maryland	2.39%	1960-2000
Washington County	1.83	1960-2000
United States	1.57	1960-1980
Garrett County	1.17	1960-2000
Allegany County	.47	1960-2000

These figures substantiate the fact that Allegany County is an area which needs substantial help to keep up with the rest of the State and the United States.

The problems of Western Maryland stem from the transition from dependence on the coal-steel-railroad economy to new types of manufacturing and service employment. Many of its communities suffer from environmental problems which are the legacy of past industrial and mining activities, and include mine drainage pollution, mine subsidence, blight from strip mining, and

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flooding. High priority has been given to solving these environmental problems through the use of supplemental grant funds and other Federal and State programs.

Under the provisions of the Appalachian Regional Development Act of 1965, in order to justify the investment of Federal and State and local funds, an area must be identified as having significant potential for future growth. Cumberland was so identified, which means that it is an area of high potential for future growth and contains two geographical elements -- an urban center and an associated hinterland.

Hagerstown was also identified as a primary growth center, with Hancock as a secondary growth center in that general area of influence, while Westernport and Oakland-Deep Creek Lake were named secondary growth centers in the general area of influence of Cumberland.

With the completion of the Appalachian Corridor E, it is expected that Cumberland's development will be west toward Frostburg and south toward McCoole and Westernport.

Cumberland has two industrial sites ready for immediate use with all the necessary access roads, water and sewer, and other utilities already in place. A third site under multiple ownership consists of 1,150 acres, 5½ miles south of the city limits. It lies between Route 220 and the Potomac River. Both the B & O and the Western Maryland Railway run right through its entire length.

With the completion of Interstate Route 70 and Interstate Route 81, it is expected that Hagerstown's development will be west toward Hancock, north to the airport, and south toward Williamsport.

Hagerstown's successful industrial development programs have resulted in the creation of several industrial park areas. The first, a 150 acre area owned by the City, now contains eight new plants. The Hagerstown Municipal Airport Industrial Park, also owned by the City, has one major plant under construction and sites provided for five future facilities. The Interstate Industrial Park, containing in excess of 300 acres, is being publicly developed at the interchange of routes I-81 and U.S. 11. Approximately 1,000 acres of privately owned property are also in reserve for industrial use.

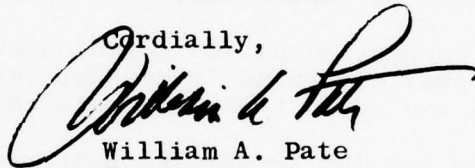
Mr. Paul W. McKee

August 1, 1968

The Appalachian Maryland Development Plan provides the rationale for fulfilling the stated objectives and for uplifting Western Maryland. A three year project status report on Maryland allocations under the various sections of the Appalachian Act is enclosed. It shows that investments are being made in education, sanitation, health, conservation and recreation, which are planned to insure an economic growth greater than the national average.

As a result of Federal, State and local investment in Appalachian Maryland, prospect for the future is bright. The primary growth centers of Cumberland and Hagerstown, as well as the secondary growth centers of Oakland, Westernport, and Hancock, including their respective counties, have been and are alert to the need "for developing more effective plans and programs." The basic studies have been made, the machinery is there, and plans are being continually expanded and refined.

Cordially,

A handwritten signature in dark ink, appearing to read "William A. Pate", written in a cursive style.

William A. Pate
Director

WAP:an
Enclosures

COUNTY WATER AND SEWERAGE PLANS

BODY OF REPORT PORTION

1. GOALS:

Comments on the overall philosophy behind the county Comprehensive Plan. These should clearly show the ultimate goals which the county hopes to reach through the execution of the plan.

NOTE:

The consulting firm may aid in establishing these goals.

Examples:

- (a) To control subdivisions and building in conformance with the county planning act and zoning ordinances.
- (b) To provide for orderly expansion of water and sewer systems.
- (c) For the health, welfare, and safety of the people.

2. DESCRIPTION OF COUNTY:

A brief description of the county, supplemented with maps; of its population and industrial distribution, agriculture, general topography, soil and physical characteristics, natural resources, rivers, streams, bays, adjacent counties or other political jurisdictions having common problems or sharing in common water resources, etc.

Prepare a base map showing all significant physical features, such as topography, hydrography, etc. All existing and proposed road and transportation nets, land use, industry, utilities, schools, etc. should also be included. The preferred map scale is one inch to a mile on which is superimposed the State Modular Grid of 1" = 5,000'. The standard numbering of the modules in each quadrangle is shown on Page 20. Use of some larger scale for details

of individual areas may be preferred. Other maps showing specific physical data or illustrating some portion of the descriptive narrative is strongly suggested.

A number of consultants have concerned themselves regarding the requirements of third party agents such as the FHA. A great deal of the information set forth in their guidelines can be presented in tabular form. A Comprehensive Plan for water and sewerage is not concerned with geological formations and their description, per se, (for example): to state that the prognosis for securing ground water from an aquifer in such a formation is good or is not good, is the desired information. The mere fact of the existence of a particular geographic formation is not the desired information insofar as water and sewerage is concerned. Likewise, if the existence of an airport in a county has, or is likely to have, an effect upon commerce, population, or other growth parameters it is worth knowing about and being reported for those reasons. The reasons, however, should be stated. It is not sufficient merely to report the fact of the airport. If the airport has no significance, it need not be reported. These are examples only, and it is hoped that they serve to illustrate the kinds of information that should be presented and the ways in which such information should be used.

For purposes of uniformity, it is preferred that the map symbols showing existing and proposed facilities as noted on page 21 be adopted. It is also preferred that

symbols have delineating areas or showing where individual water and sewer lines are proposed conform to the symbols shown on page 22 .

3. POPULATION DATA:

Use of tables, charts, and maps to show historical, existing and future population distributions, preferably according to the Maryland Modular Grid, based on the latest county or municipal land use plans and zoning requirements. Population and industrial development should be projected for the design year. These projections will be used as a basis for determining future water supply requirements and waste water volumes. Methods of determining these data should be summarized, along with comments that will serve to support the effectiveness and accuracy of such data.

NOTE:

The information concerning the succeeding 10 year period should be detailed and very thorough.

Socio-economic parameters of the County should be investigated to the extent that such factors would affect the water and sewerage needs. Said investigation might include the education and employment status levels, customs, habits, and racial mix of the people, also, technological developments, new devices, tax base evaluation, administrative actions, and any other discernible factors; by per capita or other unit of consumption measurement.

NOTE:

Trends and rates of change of all the preceeding information should be clearly indicated in map, graphic or tabular form.

Present the distributed population, by area (module, sub-district, election district, etc.) on a transparency or mylar film; which becomes the first overlay; illustrating the projected population densities and distributions.

NOTE:

These projected populations are presumably the ones expected, in response to the land use found in the base map.

4. WATER SUPPLY:

Description and tabulation of all existing and significant water systems and facilities including the industrial water supplies. Give a description and locate by module: sources, intake structures, wells, volume of water used, areas and population served, quality, treatment, storage, transmission and distribution, etc., for every community and industrial supply. Indicate any existing deficiencies and any expanded or additional facilities needed to meet existing requirements. A map supplement showing this information is suggested as part of an overlay discussed on page 12.

5. DATA INTERPRETATION (Water):

Analysis and discussion of any anticipated changes in volume of water required for the various uses based on information supplied by Sections 3 and 4 and also on the County land use studies and zoning requirements. Such added information as planned road networks, recreational facilities and potentials, residential areas, trends in real estate values, industrial development, agricultural land pattern,

production trends, natural resources and economic potentials, etc. should be considered in conjunction with the County land use and zoning pattern.

6. PROJECTIONS OF FUTURE WATER NEEDS:

Determination or projection of future water supply requirements up to design year by appropriate subdivision and by decades. Delineate those areas that will be requiring water facilities up to the design year under the following categories:

- a. Community systems must be provided
- b. Individual systems used during an interim period
- c. Individual systems installed or used indefinitely
- d. Areas where no individual or community systems will be required or desirable, such as forested lands, etc.

The first 10 year increment should be developed in greater detail, and in yearly, priority, or equal increments.

NOTE:

Every portion of the county should come under one of these headings. A further breakdown of Paragraphs a, b, c and d would include:

1. The location of existing community systems that are considered adequate.
2. Where new and improved systems are now under construction or in final planning stages.
3. Where new systems will be given immediate priority. Such projects should be those ready for construction by fiscal year 1973 but not beyond calendar year 1974.
4. Delineate those areas where community water systems will be programmed for the first 10 year increment.
5. Delineate those areas where water systems are not reasonably foreseeable during the first 10 year increment.

A great deal of the information required in this Section 6 can be shown by the development of tables, charts, and graphs.

7. ALTERNATIVE POSSIBILITIES (Water):

Analysis of possible alternative sources of supply including availability, adequacy of sources, facilities needed for development, qualities, quantities. Discuss social, economic, and other costs and considerations in conflict with other possible uses for the same water, including instream uses for fish, recreation, etc., and effects on other downstream uses.

Recommendations or proposals for development of a specific source or sources, and indication of areas to be served, including the economic factors and costs involved, in relation to the evaluation of alternative possibilities. Some discussion of these matters should be included, and reference should be made either to Section 12 or to additional tables in this Section included for comparative purposes.

8. RECOMMENDATIONS FOR WATER SUPPLY:

These recommendations should be those found to be the most effective, in order to achieve the proposed objectives.

Presentation of recommended plan for water supply development, broken down by types of facilities such as dams, wells, distribution mains, treatment works, tanks, pumping stations, plants, etc., and their estimated cost; location and areas served. These recommendations are presumably based on all the information presented in Sections 3, 4, 5 and 6. Where appropriate, reasons for including specific proposals of action should be presented; this information could include,

Law
(c)1(iv)
(b)4(v)

but is not limited to: economic factors, the political facts of life, the needs of industry or subdivision development, geographic considerations, the professional judgment of the planner or the engineer, petitions of citizens in the area, requirements of the regulatory agencies, etc. much of this information could be presented in tabular form. A lot of this data can be shown in appendic..

Schedules should include a detailed program(yearly, priority, or incremental program) for the 1970-1980 decade and a long-range more generalized program for the period beyond 1980. It should show type of facility, capacity, location, year of proposed construction (if possible), cost of construction, and any operating requirements or costs involved. Where joint or combined facilities involving other political subdivisions are involved, these should clearly be shown and delineated with a description of the degree of sharing and responsibility to be accorded each such participating jurisdiction.

Present the recommended system and the existing water system (discussed in Section 4) on a transparency or mylar film; which becomes the second overlay, showing the recommended water system for the period 1970 to 1980. Every portion of the county should be delineated in the proposed categories listed in Section 6. Coloring or other techniques, showing these areas, is suggested. The existing water supply situation discussed in Section 4 should be included. This overlay presumably responds to the base map and overlay No. 1.

Law
(b)3(i)
(b)3(ii)
(b)3(iii)
(b)4(i)
(b)4(iii)

9. WASTEWATER COLLECTION AND DISPOSAL:

Description and tabulation of all existing facilities (community, individual, industrial) including trunk lines, interceptors, pumping stations, treatment works, capacities, types, types of treatment, degree of adequacy, location, area served, quality and quantity of waste handled, industrial loadings, etc., quality of final effluent, location of discharge, and effect upon receiving water body in accordance with the Water Quality Standards. Show on maps, (as part of an overlay discussed on page 15) and in tabulation where appropriate. Indicate any existing deficiencies and any expanded or additional facilities needed to meet existing requirements.

Inventory of those industries which discharge raw or inadequately treated wastes into receiving streams should be included.

10. DATA INTERPRETATION (Wastewater):

Analysis and discussion of anticipated changes in wastewater volumes. A detailed account of the necessary treatment required for municipal and industrial discharges and the possibilities of tying industrial discharges into a community system, based on stream quality and other requirements of the state. Use of information developed in Sections 3 and 9, land use studies, and zoning requirements to establish said changes.

11. PROJECTIONS OF FUTURE WASTEWATER NEEDS:

Determination and projection of future wastewater volumes to design year by appropriate subdivision, modular location and by decades. Delineate those areas that will be requiring wastewater facilities up to the design year under the following categories:

- A. Community Systems.
- B. Individual systems used during an interim period.
- C. Individual systems used indefinitely.
- D. Areas where no community or individual systems will be installed or where such systems would be undesirable.

The projections for the first 10 year increments should be developed thoroughly and in phases.

NOTE:

Every portion of the county should come under one of these headings. A further breakdown of Sections a, b, c and d would include:

- 1. The location of existing community or industrial systems that are considered adequate.
- 2. Where new or improved sewerage systems are now under construction or in the final planning stages.
- 3. Where new systems will be given immediate priority. Such projects should be those ready for construction by fiscal year 1973 but not beyond calendar year 1974.
- 4. Delineate those areas where community sewerage systems or separate industrial sewerage systems will be programmed for construction within the first ten year increment.
- 5. Delineate those areas where community sewerage systems are not reasonably foreseeable during the first 10 year increment.

12. ALTERNATIVE POSSIBILITIES (Wastewater):

Analysis of the possible schemes for disposal of the wastewater in each case, including an analysis of the assimilative capacity of the several receiving streams or other water bodies, the instream and other downstream uses for these

waters, their hydrology, and the water quality required to be maintained by the state standards and/or required to meet their other project uses, under the appropriate conditions of low flow specified in the State Standards. Where joint or combined facilities involving other jurisdiction appear to be warranted or needed, the desirability and practicability of their accomplishment shall be included in the analysis.

13. RECOMMENDATIONS FOR WASTEWATER DISPOSAL:

Presentations of the recommended program of wastewater and industrial wastewater collections, treatment and disposal facilities for the county, broken down by types of facilities such as collector and interceptor mains, pumping stations, treatment works, outfalls, etc., their cost, locations, and community served, and by stream, bay, and river basin involved. These recommendations are presumably based on all information presented in Section 3, 9, 10, 11 and 12. A lot of this data can be shown in appendices. Schedules should include a detailed incremental program of construction for the 1970-80 decade, and a longer range more generalized program for the year 1980 to design year period. It should show the type of facility, capacity, and type of treatment where appropriate, location, year of construction, if possible, cost, and any operating requirements or costs involved. Capital improvement programs illustrate a means of stating cost needs in incremental periods.

Law
(c)1(iv)
(b)4(v)

Regulation
0402
L,G.

Include a table showing the water quality standard of each stream reach in the county from the Department of Water Resources Regulation 4.8. This is a useful device for showing how recommended degrees of treatment match adopted water quality standards. Where joint or combined facilities involving other political sub-divisions are involved, these shall clearly set forth, and the degree of sharing and responsibility of each participating jurisdiction indicated. Present the recommended system and the existing sewerage system (discussed in Section 9) on a transparency or mylar film; which becomes the third overlay showing recommended wastewater system for the period 1970-1980. Every portion of the county should be delineated into the proposed categories discussed in Section 11, concerning wastewater facility requirements. Coloring, etc., is again suggested. It is further recommended that a coloring scheme showing the water quality uses, developed in the table of Section 13 be shown. Also the existing wastewater situation discussed in Section 9 should be shown. This overlay presumably responds to the base map and overlay No. 1.

14. FINANCING:

A time table breakdown of the proposed costs of constructing the facilities required. Methods and means of financing these projects should be included in the report. Comments on maintenance and operation costs should be included.

Example:

	1970	1971	1972.....1980
Water facilities	Phase I for Old Town		
Wastewater facilities	Interceptor for New Town		
Proposed Costs	\$130,000		<u>ETC.</u>
Means of Financing	Case Rule		

15. APPENDICES:

Here may be placed a whole series of appendices; numbered, lettered or coded, to present back-up data, tables, and charts that reflect judgments on the wealth of information that is being gathered. The virtue of these appendices are that they may be printed separately, or readily revised; serve to keep the background data up to date and are extremely helpful to the regulatory agencies, corporate communities, county planning groups, and consulting engineers on future projects.

Examples of the kinds of information that might be best presented in appendices form are:

1. Geographic data, co-related with well yields.
2. Flow data, flood information, time of travel and other surface water information presented in both narrative and tabular form.
3. Back-up population information.
4. Existing water and sewerage system data, with tables showing deficiencies and needs.
5. Fuller discussions of individual communities and the water and sewerage needs in both narrative and tabular form. A separate appendix

may be preferred for each community or sub-area being discussed.

6. Soil data and judgments thereon.

Enclosed also for consideration on page 23 is a coded inspection form for sewage treatment facilities. This may be particularly useful either to the consultant in preparing existing system data or to the county and state in up-dating data.

16. BIBLIOGRAPHY AND REFERENCES:

This is a useful place to make an annotated bibliography which would steer future readers to fuller treatments of specific aspects of the plan that are, of themselves, outside the scope of zoning ordinances, county resolutions, legislation or case references, the planning literature, etc.

STATEMENT REGARDING POTOMAC RIVER BASIN
RESERVOIR PROJECTS PROPOSED FOR AUTHORIZATION

Mr. Chairman, my name is Herbert M. Sachs. I am Chief of Planning with the Maryland Department of Water Resources. My statement represents the views of the State resource and planning agencies and has been concurred in by the office of the Governor.

State Activities

When the Corps of Engineers submitted its North Branch Report in 1961, the then Governor J. Millard Tawes directed the State Planning Department to coordinate the views of all concerned Maryland agencies in formulating recommendations regarding the 1961 study and the subsequent comprehensive basin plan. The comprehensive report of the Corps was released in 1963. At that time, the Planning Department evaluated the Corps' report and, after coordinating its findings with the views of the other State and local agencies, prepared a report defining the position of the State of Maryland. Among other recommendations, the report emphasized the need for flow regulation to meet water supply requirements in the D. C. metropolitan area and the Monocacy sub-basin. The report also provided strong support for the small watershed program included in the comprehensive plan. Furthermore, it recognized that an accelerated water quality program must be an integral part of the basin development program. These points will be commented on in more detail; however, here it will suffice to indicate that these conclusions are even more valid today.

Since the 1963 report of the Corps of Engineers was released, the State agencies have taken a very active role in the various activities relating to water resource development in the Potomac

basin. These activities include close liaison with the Interdepartmental Task Force, direct involvement in the sub-task forces which were created, and participation in the Appalachian, North Atlantic and Northeastern regional studies. Each of these programs approaches the problems of the basin or a portion of the basin in a little different manner -- all have served to broaden the perspective for considering resource development needs in the basin.

The State has also initiated a number of State-wide programs which are closely related to Potomac Basin development. Last year, Maryland had its water quality standards and implementation plan approved by the Secretary of the Interior. These standards recognize the water and related land uses that are being considered for the Maryland portion of the basin. As part of the implementation plan, State legislation was enacted last year which required each of the counties to prepare a comprehensive water and sewerage program by the year 1970. These studies will define in detail the local water supply and waste treatment needs and facilities required to meet these needs. The county studies will also provide the State with a rationale for investment in water supply and waste treatment facilities. To further implement the water quality standards of the State, a 129 million dollar bond bill is now before the Maryland General Assembly which if approved will provide:

1. \$100 million in State funds to match Federal grants for construction of waste treatment facilities.
2. \$25 million for loans to local governments for construction of sewers and sewerage projects and
3. \$4 million for matching Federal funds under Section 3 (c) of the Clean Waters Restoration Act of 1967 (comprehensive basin water quality programs). It is this latter program, the basin pollution abatement studies, which the State will use as the instrumentality to integrate the county water and sewerage studies into basin or

regional water quality programs.

All of these programs mentioned indicate the State's sincere effort in developing a water quality program that is necessary to complement the dam and reservoir construction program.

Still another activity on the State level relating to Potomac Basin development is a program of technical and financial assistance in the small watershed program. The State recognizes that good impoundment sites are becoming scarce, and, in order to encourage optimal development of the remaining sites, will now co-sponsor PL 566 projects which include conservation storage. In the Potomac basin alone, there were 43 sites identified in the 1963 report; on the basis of further studies conducted under the guidance of the Interdepartmental Task Force, the number has now increased to 68. This brings up a very significant point which I believe should be emphasized here. In the 1963 report of the Corps of Engineers, there was a successful attempt to meet water development needs utilizing both large dams and the small watershed structures. The State believes it desirable that both the large dam and small watershed program continue to be considered as integral parts to a comprehensive program and that their development be pursued simultaneously.

Comment on Specific Projects

1. Sixes Bridge

Without any reservation, the State agencies urge the highest priority for authorization be assigned to the Sixes Bridge project in the Monocacy sub-basin. As has been previously indicated to the Corps of Engineers and the Interdepartmental Task Force, this project

is strongly supported by all the Maryland political subdivisions concerned. These local jurisdictions have already provided the necessary assurances with respect to obligations under the Water Supply Act. Furthermore, Governor Spiro T. Agnew has indicated that the State will assume the non-federal obligations required under the Federal Recreational Facilities Act. It might be added that while Sixes Bridge has very strong local endorsement and is needed for meeting water requirements in the Monocacy sub-basin, its proximity to the D. C. metropolitan area (being the closest of the proposed sites) adds still further merit to this project. Because of its importance to two of the major water supply needs areas in the lower basin, Sixes Bridge should be considered for the earliest possible construction.

2. Town Creek

The proposed Town Creek Reservoir located in Allegany County is one of the projects designed to be operated for downstream flow augmentation. It is also a major component of the Paw Paw Bends recreational program being considered by the Task Force. The State resource and planning agencies strongly support this project.

While there are no local water supply needs at present, Allegany County has indicated interest in the project with respect to the land-use development that would be stimulated in the vicinity of the reservoir. To assure that such development will be in the best interests of the county, the County Commission has asked for information pertinent to water and related land uses that would be permitted in the project area. This information is also necessary for planning water and sewerage facilities in the county planning study to accommodate the expected development. It is anticipated that subsequent and more detailed studies will provide the necessary information.

3. Sideling Hill

The Sideling Hill project, located on the stream forming the common boundary between Allegany and Washington County, is another one of the reservoirs included in the Paw Paw Bends recreation complex. Again, the flow augmentation benefits are not in the immediate area, but downstream.

In this sub-basin, the Maryland Department of Game and Inland Fish has extensive land holdings devoted to wildlife management. In addition, Sideling Hill Creek is one of the permanent trout streams in the State. The Department is concerned that, as presently planned, the project would virtually eliminate its program in the area. The anticipated reduction in the wildlife management program could not be mitigated within the sub-basin because the best lands for this purpose are in the project area. From the viewpoint of the Department's program, an impoundment further upstream would be far more desirable. The proposed site location for the dam is only a mile and a half above the confluence with the Potomac River; if the dam were moved further upstream, the present trout fishery would be enhanced without jeopardizing the future of the Sideling Hill wildlife management area.

With respect to local views on this project, Allegany County has indicated that it would be guided by the decision of the State. The County Commissioners of Washington County did not indicate any opposition to the project, but requested more information, particularly about cost allocations, before making a final decision.

Based on these views and comments, the State assumes the position that it would support this project if the various problems can be satisfactorily resolved.

4. Verona, Chambersburg, North Mountain and Little Cacapon

The State has no objection to any of these projects and would support the position of the concerned jurisdictions.

5. Savage II

The proposed Savage II dam in Garrett County is not included in the present listing of projects although in the Interim Report of the Task Force, Maryland had asked for its consideration. The need for this project is now being studied by the Federal Water Pollution Control Administration in conjunction with the Appalachian Water Resources Study. At the same time, the counties are considering the merits of this project in developing their water and sewerage planning programs. Here again the State would have to defer a decision regarding this project until the findings of these studies are available.

Need for Comprehensive Plan

As the complexity of proposed development in the Potomac Basin grows, there is an urgency for the preparation of a comprehensive, but flexible basin plan integrating all of the various components. This plan must include the scheduling and the effect of both the large and small dams proposed for construction. The importance of such a plan is realized when allocating costs for water supply storage among downstream beneficiaries who will be paying for water storage in a number of projects. Once this information is available, the State and the political subdivisions will be in a far more advantageous position to provide the assurances required under federal law. The same is true with respect to recreation development and the non-federal obligations required under the Federal Recreation Facility Act. It is hoped that sufficient information will come out of this hearing to

develop such a plan.

Conclusion

In conclusion, the views of the State of Maryland are as follows:

1. endorsement of the Sixes Bridge and Town Creek projects;
2. defer recommendation on Sideling Hill and Savage II;
3. no objection to Verona, Chambersburg, North Mountain and Little Cacapon;
4. need for integrating and pursuance of the small watershed program in conjunction with the large dam development; and
5. need for a comprehensive plan.

Preliminary Draft

August 22, 1968

Re: Senate Bill S. 3157 "Potomac National River Act"

The following constitutes comment by the Maryland Department of Water Resources regarding the above-captioned Bill introduced by Senator Daniel B. Brewster in the Senate of the United States.

In view of questions held regarding the State's vested interest in the Potomac River and the effect thereupon of the proposed national river recreation area legislation, S. 3157 in its present form is unacceptable to this Department.

Under the terms of the Bill, the Secretary of the Interior is authorized to acquire private lands and waters on both sides of the Potomac River by donation or purchase (and thus also by the power of eminent domain) but may acquire State or local government owned land only with the consent of the owners. This Department is advised that it is the intention of the Secretary (i.e., the National Park Service) to acquire fee ownership of all of the river bank (the 600 foot average "green sheath" on each side of the Potomac) so as to preserve this land from private development "incompatible" with national river purposes. Additional land within the recreation area would be controlled through the use of scenic easements or lease-back and sell-back methods where, in effect, all development rights are purchased or where the development of land is permitted only upon terms "compatible" with area purposes. These provisions are sufficiently vague as to warrant the following observations:

1. The acquisition by the Federal Government of an unbroken stretch of riparian land for the entire course of the river within the recreation area will thereby provide the Federal Government with the legal right to exclude all other actual or potential users of the lands bordering on the river and the river waters within the proposed national river recreation area (Maryland Attorney General's Opinion, December 21, 1967, P. 4). Under these circumstances, there would simply be no other riparian owner. Since there is considerable use of the waters of the Potomac by industries, municipalities, utilities, and farmers within the designated limits of the national

river, any of these users who are not riparian owners run the risk, in event the Federal Government becomes sole riparian owner, of being forced to cease their drawing of the river waters. This legal fact would seem to remain despite disclaimers to the effect that such a policy would be contrary to the intent of the Bill's authors. It is also noted that the Federal Government, through the Department of the Interior, owns the C and O Canal that parallels the Potomac River within the proposed recreation area. The Secretary is authorized to grant easements for right-of-way for utility lines for commercial, industrial, or agricultural purposes through, over, or under the lands bordering the canal. However, regulations have never been promulgated by the Department of the Interior concerning such easements. Thus, the Department of Interior already has the power to exclude users from the Potomac waters insofar as their pipelines must cross the canal, and this determination is at the sole discretion of the Secretary. The creation of the Potomac National River would, in effect, extend this power of exclusion to those users located between the canal and the river.

2. In at least one case, the establishment of a national river may be in conflict with existing Federal-State developmental plans for the Potomac Basin. The Corps of Engineers have justified the authorized Bloomington Dam project partly on the basis of projected water supply "needs" in the Potomac Basin. Maryland has recognized the value of this project and has given assurances to the Federal Government that the State will pay for a major portion of the water supply cost allocation. It must be clearly indicated, however, that these assurances were premised on the assumption that there would not be a problem of access to the Potomac River. The existence of Federal river lands where proposed adjacent heavy water using industries and certain recreational activities are

declared to be incompatible with the area's recreation mission would constitute such a problem.

3. It is maintained that the overall development and management of the national river will be achieved through the efforts of local, State, and Federal agencies, and that administration of the area will be a coordinated effort. The Bill, however, makes no provision for such administration. Moreover, it would seem that the creation of a temporary "Potomac National River Advisory Commission" whose members are appointed by the Secretary, and whose function is to consult with the Secretary from time to time with respect to matters of national river development, is merely a cursory gesture toward coordinated management and development effort. Surely, the most far-reaching policy decision to be made regarding the national river would be that which determines what land use is or is not compatible with national river purposes. This Department is advised that compatible land use decisions will ultimately rest with the National Park Service. Within National Recreation Areas, outdoor recreation is recognized as the dominant or primary resource management purpose. If additional national resource utilization is carried on, such additional use must be compatible with fulfilling the recreation mission, and none will be carried on that is significantly detrimental to it (USDI, National Park Service, Administration Policies, P. 13). This policy would indicate that industrial development adjacent to or near the river or the recreation areas would be subject to exclusive Park Service approval. Federal Government power to exclude private users of the Potomac waters, i.e. power which may ultimately have a profound negative influence on economic development, is clearly not within the best interests of the State.

In summary, it should be emphasized that since the Potomac River drainage area includes a sizeable portion of the State (31%), access to the river necessarily becomes a controlling land use factor not only between the C and O Canal and the river, but to much of the entire basin. If the national

efficiency objective is adhered to, the development of a major portion of a river basin for the primary purpose of recreation (and thus pre-empting its use for other purposes) is questionable, particularly in view of current subjective methods for the valuation of recreation benefits. In any case, the problems of access and compatible development are too important locally to leave to the discretion of the Secretary of the Interior or to the policies of a single purpose Federal recreation agency.

In the interest of encouraging value optimization in the use of the Potomac River water resource by satisfying the imperative of economic as well as recreational development, the following recommendations are offered:

1. That the National Park Service designate certain recreation enclaves or key areas along the Maryland side of the Potomac River.
2. That in conjunction with the enclave concept, only limited stretches of riparian land be acquired in fee ownership by the Department of Interior, i.e. those shorelines behind which the recreation enclaves will be developed.
3. That the intervening lands along the Potomac River be held in non-Federal ownership for development in response to industrial and/or supplementary recreation demands as they become articulated.
4. That a Potomac Recreation Area Advisory Commission be created and members appointed by the boards of commissioners or the county councils, as the case may be, of the counties concerned, and by the Governor of the State of Maryland to assume the responsibility for determining and planning land use to assure rational development of the intervening areas; and to meet and consult with the Secretary on general policies and specific matters related to land acquisition and development of the recreation enclaves.
5. That the C and O Canal be restored and administered under the recreation area concept within the several enclaves, and that the remaining portions of the canal be placed in an administrative category that is amenable and responsive to other needs.

6. That prior to any Federal acquisition of land and/or development of existing land, a precise policy on access be established by the Secretary upon approval by the Potomac Recreation Area Advisory Commission.

These recommendations are designed to facilitate effective management of the water resource of the Potomac River. As the pressures on major water supply sources intensify, emphasis must shift from merely capturing individual water services to methods of establishing integrated control over the flow of water in a river in order to increase the net amount of services that can be made available.

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DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 5
MISSISSIPPI WATER SUPPLEMENT

DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
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CHAPTER 5
MISSISSIPPI WATER SUPPLEMENT

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Foreword

The Congress of the United States in 1965 passed the Appalachian Regional Development Act. Section 206 of that Act authorized and directed the Secretary of the Army to prepare a comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian Region. The Act, revising and updating the Appalachian Regional Development Act of 1965, which was enacted in 1967, included 20 counties in the State of Mississippi in the Appalachian Region. These counties are: Marshall, Benton, Tippah, Alcorn, Tishomingo, Union, Prentiss, Pontotoc, Lee, Itawamba, Chickasaw, Monroe, Webster, Clay, Lowndes, Oktibbeha, Choctaw, Winston, Noxubee, and Kemper. Therefore, they are included in the Corps of Engineers' consideration of comprehensive water resource development for the Appalachian Region.

The Mississippi Supplement to the Appalachian Water Resource Plan was developed in response to a request by the Office of Appalachian Studies, Corps of Engineers, that the States supply an independent element of the Study. Water resource development projects which will aid in the economic development of Mississippi's twenty Appalachian counties are proposed.

The projects recommended in the Supplement are based on research set forth in detail in An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi. Also, a survey was conducted of all federal, state and local agencies concerned with water resource projects in Mississippi to determine those projects which they felt would contribute to the economic development of their respective jurisdictional areas.

This report, which contains both new material and excerpts from An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi, is Mississippi's input to the U.S. Army Corps of Engineers Water Resource Development Plan for the Appalachian Region.^{1/} It is hoped that the Appalachian Regional Commission, State, local and area development groups, will find the study useful in their work.

Kenneth C. Wagner, Director
Mississippi Research and Development Center

^{1/} The report combination was effected in the Corps' Office of Appalachian Studies by J. S. Matthews, Study Coordinator.

SUMMARY

MISSISSIPPI'S STATE INVESTMENT PLAN

Mississippi submitted in January of 1968 its first State Investment Plan for the economic development of the Mississippi Appalachian Area. The Plan said, "Mississippi's objective in its Appalachian area can be simply stated as follows: the problems of the area, principally its economic short-comings, must be identified and the opportunities for 'economic growth' capitalized upon, in order to contribute as nearly as possible to the goal of raising income and the standard of living."

The Plan continued, "The State's goal is to achieve equity with the Nation in terms of per capita income The chief measure of success will be to increase the income of the people; however, the quality of the environment must be assured, and the sensible use of resources - both human and natural - maintained Specifically, the State's plan is to concentrate efforts in the areas of transportation, vocational and technical training, comprehensive medical health programs, community and area development, recreation, and water resource development."

The State Investment Plan included the following section concerning water resource development: "Mississippi Appalachia has one principal water resource - the Tombigbee River. Navigation, as planned by the U.S. Corps of Engineers, will greatly stimulate the economic development of the area. Plants requiring water transportation (paper, chemicals, metals, etc.) will find the waterway an ideal location."

"Initial investment in water resources is proposed to be concentrated on projects which will eliminate flooding in areas subject to immediate development. Also, early development of water-related port facilities and industrial areas is considered important to the growth of the area. Since the 20-county Mississippi Appalachian Area has access to a waterway at only one location at the present time (Lake Pickwick Reservoir), investments of this type are proposed to be concentrated there."

In summary, the Mississippi State Investment Plan proposed that investments be concentrated in those areas where the greatest return can be expected for the funds invested and where returns can be expected in a reasonably short period of time.

Water resource projects presented in this report, Mississippi Supplement, Appalachian Water Resource Plan, are evaluated primarily on the basis of their contribution to the economic growth of the Mississippi Appalachian area. Those projects which have clear potential

for economic growth (primarily in terms of creating jobs and income) will be given high priority; those which contribute to the development of identified primary growth areas within the twenty counties are given high priority; and those which have clear significance for over-all area development, even when located outside a growth area, are given high priority.

The Mississippi Supplement, Appalachian Water Resource Plan, is a study which all water resource development projects proposed for the 20-county Mississippi Appalachian Area have been considered. A survey of all agencies related to water resource development in Appalachian Mississippi further contributed to the list of proposed projects. Mississippi's State Investment Plan proposes investments in water projects concentrated in those areas where the greatest return can be expected for funds invested and where returns can be expected in a reasonably short period of time.

Projects examined in this report are divided into three categories: high priority, priority, and other. Priorities were assigned to projects based on both their importance toward achieving the State's goals for economic development as stated in the companion document to this report, and on the affects of a water resource project on primary growth areas in Appalachian Mississippi.

Ranking at the top of the high priority projects is the proposed Tennessee-Tombigbee Waterway, a key link in the total economic and related water resource development of Appalachian Mississippi. Eighteen other high priority projects were considered which would contribute directly to economic development in terms of achieving goals, or which are economically feasible based on detailed study of costs and benefits. Projects in this category include: port development at Pickwick Lake, in Monroe County and at Columbus; recreation near major population centers and along the Tennessee-Tombigbee Waterway; and flood control on strategic streams throughout the area. A number of municipalities desperately requiring additional water and/or sewage facilities were given high priority.

Priority water resource projects may not be vital to development of primary growth areas but will greatly affect the overall Mississippi Appalachian Area. Included in this section are projects of a flood control or channel improvement type.

Other water resource development projects were submitted by private and public agencies concerned with water and related resource conservation and development. Projects in this category are basically of a recreation or flood control type.

I. THE MISSISSIPPI APPALACHIAN AREA

Socio-Economic Characteristics

Mississippi Appalachia encompasses 20 counties in the northeast section of the State. The Area does not contain all of the "hill" counties of Mississippi - just those having significant socio-economic characteristics, topography, and other features similar to "Southern Appalachia."

Mississippi Appalachian counties form an elongated tier, bordered on the east by Alabama, the north by Tennessee, and on the west and south by other Mississippi counties with somewhat similar characteristics.

The Area had a population of approximately 440,000 in 1965; the economy is based on industry and agriculture. Abundant natural resources are found in the Area, large quantities of water and timber in particular. Northeast Mississippi has shown progress in economic development somewhat above that of other sections of the State. However, the per capita income of the Area, despite economic growth, is below that of most other sections of Appalachia, even the critically depressed "Central Appalachia."

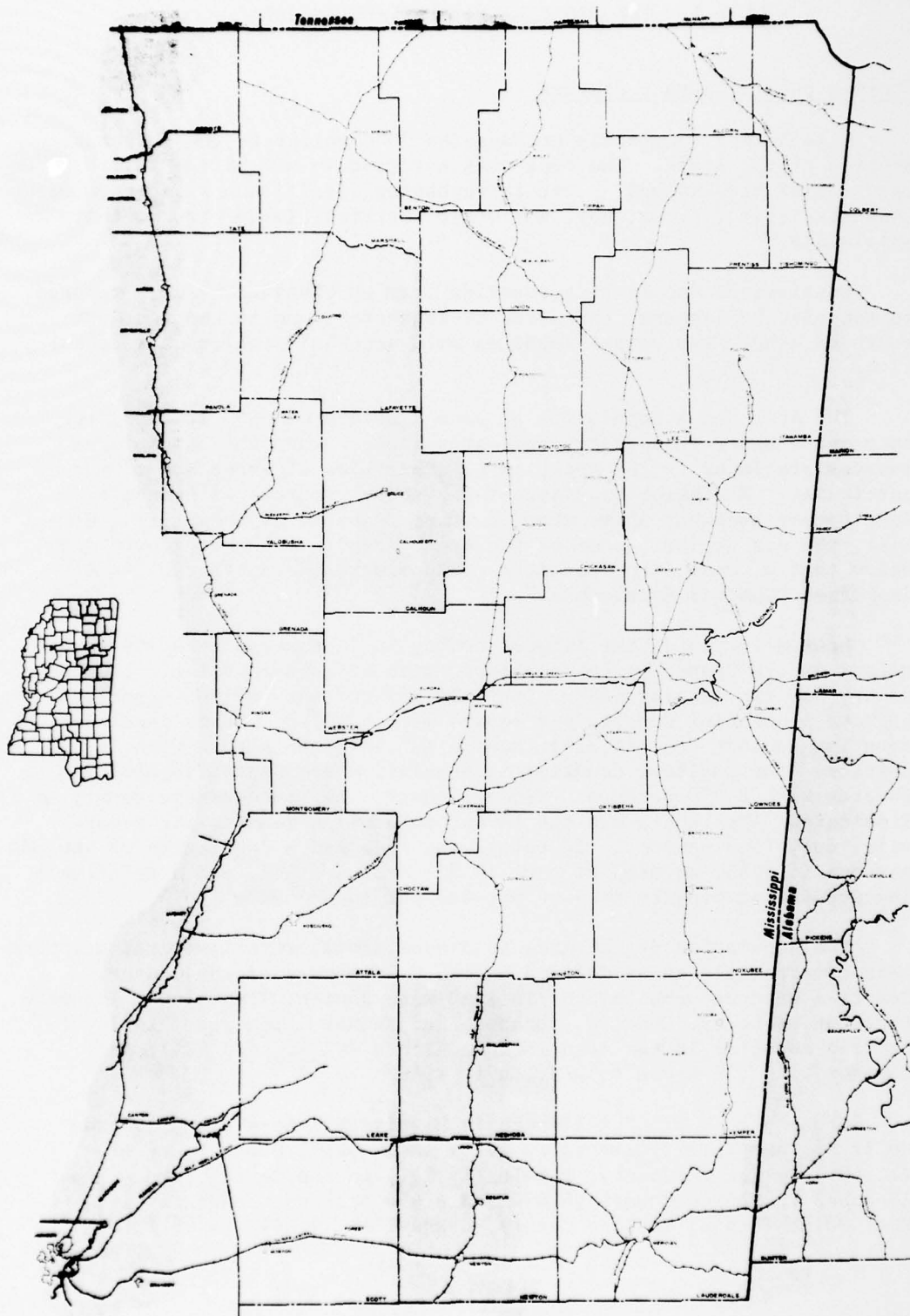
Monroe County is the largest county in land area, with 769 square miles; Alcorn County is the smallest, with 405 square miles. Lowndes County has the largest population - 54,455 persons in 1965 - and the highest population density per square mile - 107.2. Other populous counties include Lee (46,215), Monroe (35,179) and Alcorn with 26,034 persons. The smallest counties in population are Benton (8,430) and Choctaw with 8,250 persons. Kemper County, the southernmost county of Mississippi Appalachia has the lowest population density per square mile, only 15.8 persons. In total, the Area had a population of 440,060 persons in 1965, an area of some 10,321 square miles, and a relatively low population density of 42.6 persons per square mile.

The population of the Area is predominantly rural; several counties have no urban places as defined by the U.S. Bureau of the Census. Counties without urban places in 1960 were Benton, Tishomingo, Itawamba, Pontotoc, Webster, Choctaw, Noxubee, and Kemper. The most highly urbanized counties in the Area include Alcorn (45%), Lee (42%), and Lowndes with 53% urban population in 1960.

Urban places of significance in Mississippi Appalachia include Holly Springs (5,621 persons in 1960) in Marshall County, Corinth (11,453) in Alcorn County, Tupelo (17,221) in Lee County, Amory and Aberdeen in Monroe County (6,474 and 6,450 persons, respectively), West Point (8,550) in Clay County, Starkville (9,041) in Oktibbeha

8 x 10 1/2

FIGURE 1
MISSISSIPPI APPALACHIAN AREA



V-2-Miss

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County, and Columbus (24,771 persons) in Lowndes County. Numerous other small communities are scattered throughout the Area with populations ranging up to a few thousand.

Regional Economic Areas

The Appalachian Development Act emphasizes the need for multi-county development activity. In this way, the limited resources of the individual counties may be "pooled" for the common good. The facilities which are basic to the development of the area and which may be provided on a multi-county basis can be developed at centralized locations. Examples of such facilities are medical health centers, vocational and technical training facilities, large industrial development and employment centers, airports, etc.

In the Appalachian Act, the following requirement is stated: "The public investments made in the Region under this Act shall be concentrated in areas where there is significant potential for future growth, and where the expected return on public dollars invested will be the greatest."

This requirement, plus the emphasis placed on multi-county development in the Appalachian program, led to the definition of the Regional Economic Areas (multi-county groups) shown opposite and to the definition of major growth areas.

The multi-county groupings shown relate the sub-areas within the Mississippi Appalachian Area to centers of commerce and industry. These groupings were defined for the purposes of this report and may or may not become Local Development Districts as defined in the Appalachian Act. The areas as shown are primarily for planning and development purposes and were defined after consideration of physical, social and economic characteristics. Major considerations were physical features, transportation resources, employment and commuting patterns, major facilities, and the existing and potential economic development pattern of the area. Finally, the Tennessee-Tombigbee Waterway, as proposed, was given consideration as a cohesive factor in the counties adjacent to it.

The proposed areas for multi-county planning and development activities are as follows: Area I - Clay, Oktibbeha, Lowndes, Choctaw, Winston, Webster, Kemper and Noxubee; Area II - Monroe; Area III - Pontotoc, Lee, Union, Itawamba, and Chickasaw; Area IV - Alcorn, Tippah, Tishomingo, and Prentiss; Area V - Benton and Marshall. All of the data and other information presented in the following chapters of this study will be related to these five multi-county areas or to their primary growth areas.

FIGURE 2
REGIONAL ECONOMIC AREAS



V-4-Miss

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Primary Growth Areas

The 20-county Mississippi Appalachian Area has been subdivided into five multi-county areas for planning and development purposes. In keeping with the dictates of the Appalachian Development Act, primary and secondary growth areas have been defined in order to determine where the magnitude of investment should be greatest. Primary growth areas are shown in the illustration opposite.

These three types of areas are proposed to serve the following economic functions. The primary growth areas will provide locations of industries which relate best to urban or urbanizing areas. They also will provide locations for industries which need a diverse labor force, specialized facilities, or urban services. Many of these industries will be oriented to heavy production; however, those with obnoxious characteristics, e. g., paper production, may desire more isolated locations meeting the special locational requirements of the industry. The major growth areas also will be the locations for the majority of new growth in the retail and service areas of the economy. Much of the new investment, both public and private, will be concentrated in the five primary growth areas within the Mississippi Appalachian Area.

Secondary growth areas will serve as locations for "satellite" industries, those industries which provide goods and services to other industries, and for industries which have few unique locational characteristics. Secondary areas will continue to grow and to develop their own economic bases; however, the magnitude of new investment in these centers will be scaled to their potential for economic growth.

The remaining portions of the 20-county Area, defined as natural resource areas, will be the locations for new investment in the agricultural, forest and fisheries, mining and extractive industries. Investments in these areas will also be scaled to their potential for growth.

Within Regional Economic Area I, major development will center around the cities of Columbus, Starkville and West Point. Individually, these cities are small centers for commerce and industry; collectively, they have the potential to develop into a metropolitan area of perhaps 300,000-400,000 people. Secondary centers within Regional Economic Area I include: DeKalb, Scooba, Macon, Louisville, Ackerman and Europa, and their environs.

Within Regional Economic Area II, the major development is centered along the proposed Tennessee-Tombigbee Waterway from Amory on the north to Aberdeen on the south. There are no secondary centers in Monroe County (Area II).

FIGURE 3
PRIMARY GROWTH AREAS



V-6-Miss

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Primary growth in Regional Economic Area III is shown in an elongated fashion from Pontotoc on the west to Fulton on the east, with the City of Tupelo at the center. Secondary centers in Regional Economic Area III include Houston, Okolona, the Nettleton-Shannon area, and New Albany.

In Regional Economic Area IV, major development will occur from Booneville to Corinth and Iuka. Included in this area is the proposed industrial complex at Lake Pickwick Reservoir and the Yellow Creek Port. Secondary centers include Tishomingo, Ripley and Walnut.

Regional Economic Area V has one major development center including the City of Holly Springs and its environs. There are no secondary centers in Area V.

Mississippi Appalachian Area - Forecast for Growth

The growth and development of the Mississippi Appalachian Area will depend upon the ability of the Area to resolve development problems and to overcome "bottlenecks" to growth, and also upon the magnitude of the Federal, State and local investment in the Area. In order to evaluate the potential for development of the 20-county Area, three separate assumptions for future development were defined:

Assumption I. The Area will do little better in the future than it has in the past. (Office of Business Economics Benchmarks)

Assumption II. The Area will develop and expand its economy based on programs such as the Appalachian program, but water resources would not be developed to their fullest extent. Explicitly, the Tennessee-Tombigbee Waterway Project would not begin until very late in the projection period, after the year 2000. (Area Growth Benchmarks)

Assumption III. The Area will develop its resources to their fullest extent, including water and related resources. This assumption includes development of the Tennessee-Tombigbee Waterway Project before 1980. (Developmental Benchmarks)

These assumptions result in three separate forecasts of area growth and development, as shown in Tables 1 and 2.

Office of Business Economics Forecast. The Office of Business Economics, U.S. Department of Commerce, forecast the growth of Mississippi Appalachia based on historic patterns of development. This forecast indicates growth rates which reflect rather conservative economic progress for the Area. If present rates of new job development continue in the Area (and there is no reason why they shouldn't), the

1980 O.B.E. projections for the Area will be exceeded handily. Therefore, these projections are considered as "low projections" and are used to measure the difference between the Area as it presently exists and how it must change to accomplish the development objectives set for the Area. O.B.E. and benchmark forecasts were disaggregated to the county level by category (population, employment and income). These data were then adjusted to account for local conditions, economic growth potentials, and the historic relationship between each county's growth and the total Area's growth. County data were then aggregated according to the five multi-county regional economic areas defined in preceding sections of this report.

Benchmark Forecast. The purpose for the Appalachian Development Act, simply stated, is to encourage the economic development of the Appalachian Region by assisting the states in providing the facilities needed to accomplish their objectives. This is proposed to be done in essentially three ways: (1) increased opportunity for employment, (2) reduced unemployment, and (3) increased average and relative per capita income.

These goals are general and do not quantify the situation in the Area for future forecast periods. In order to develop forecasts of the future development of the Mississippi and other Appalachian Areas, the Corps of Engineers, through its Appalachian Study Group Office, devised a means of evaluating the future growth of the region based on the Office of Business Economics forecast called "Benchmarks." Benchmark forecasts were developed using the following assumptions:

1. The Appalachian region will reach a per capita income of at least 95 percent of the national average by the year 2000.
2. The Appalachian region will reach a per capita income of at least 95 percent of the national average by the year 2020.
3. Areas within the Appalachian region will maintain, after 1980, the same relative population as a fixed percentage of the relative national growth in population.

Forecasts of future employment, population and income, based on the benchmark assumptions, quantify the future growth of the Mississippi Appalachian Area relative to that of the United States. However, they do not accurately state the development potential of the Area. For this reason, two sets of benchmark projects are presented.

The first set of benchmark numbers is referred to as "Area Growth Benchmarks". These figures indicate the potential growth of the Mississippi Appalachian Area based on the Office of Business Economics forecast. The figures include the effects of water resource development and the Appalachian program but, specifically, exclude

TABLE I
AREA GROWTH AND DEVELOPMENTAL BENCHMARKS
MISSISSIPPI APPALACHIAN AREA

	1960		1980		2000		2020	
	Area Growth Benchmarks	Developmental Benchmarks	Area Growth Benchmarks	Developmental Benchmarks	Area Growth Benchmarks	Developmental Benchmarks	Area Growth Benchmarks	Developmental Benchmarks
Total Employment	134,040	203,000	203,000	203,000	300,000	350,000	400,000	500,000
Agriculture	32,344	16,000	16,000	16,000	15,000	15,000	14,000	13,900
Mining	320	1,000	600	600	1,000	1,000	2,000	1,500
Construction	7,887	16,000	16,000	16,000	21,000	21,000	26,000	31,000
Manufacturing	33,591	70,000	70,000	70,000	100,000	125,000	145,000	175,100
Food	3,301	5,000	5,250	5,250	9,000	9,375	12,000	12,320
Textiles	576	1,000	700	700	3,000	3,125	5,000	5,200
Paper	51	1,000	1,120	1,120	4,000	3,850	6,000	6,160
Chemicals	472	1,000	1,190	1,190	8,000	8,125	13,000	13,200
Petroleum	51	A/	70	70	A/	125	A/	176
Primary Metals	123	3,000	2,800	2,800	8,000	7,875	11,000	10,360
Transportation, Etc.	5,874	8,000	7,600	7,600	10,000	10,000	12,000	12,000
Trade	19,008	28,000	28,000	28,000	40,000	48,000	50,000	65,000
Finance, Etc.	1,930	4,000	4,000	4,000	11,000	11,000	14,000	16,000
Services	26,763	49,000	50,000	50,000	83,000	95,000	111,000	150,000
Public Administration	3,836	8,000	8,300	8,300	16,000	21,500	25,000	31,000
Armed Forces	2,487	3,000	2,500	2,500	3,000	2,500	3,000	2,500
Population	406,187	597,000	597,000	597,000	852,000	995,000	1,112,000	1,392,000

A/ Data not of sufficient size to warrant projection.

Source: Appalachia Study Group, U. S. Army Corps of Engineers, Cincinnati, Ohio.
Mississippi Research and Development Center.

development of the Tennessee-Tombigbee Waterway until late in the forecast period.

The second set of benchmarks, called "Developmental Benchmarks", projects the future growth of the Mississippi Appalachian Area based on an in-depth analysis of the economic potential of the Area, as reflected in the studies of industrial potential in Chapter II of this study. These figures specifically assume the development of the Tennessee-Tombigbee Waterway early in the forecast period, before 1980.

Table 1 shows developmental benchmarks for the 20-county Area indicating that employment will increase from 134,040 in 1960 to 500,000 in the year 2020. Manufacturing employment will total 175,100 in 2020. Of the major water-using industries, food, chemicals, primary metals, etc., will employ nearly 50,000 persons. Growth is indicated in almost every sector of the economy, with the exception of agriculture. Substantial gains in the services and public administration sectors are indicated.

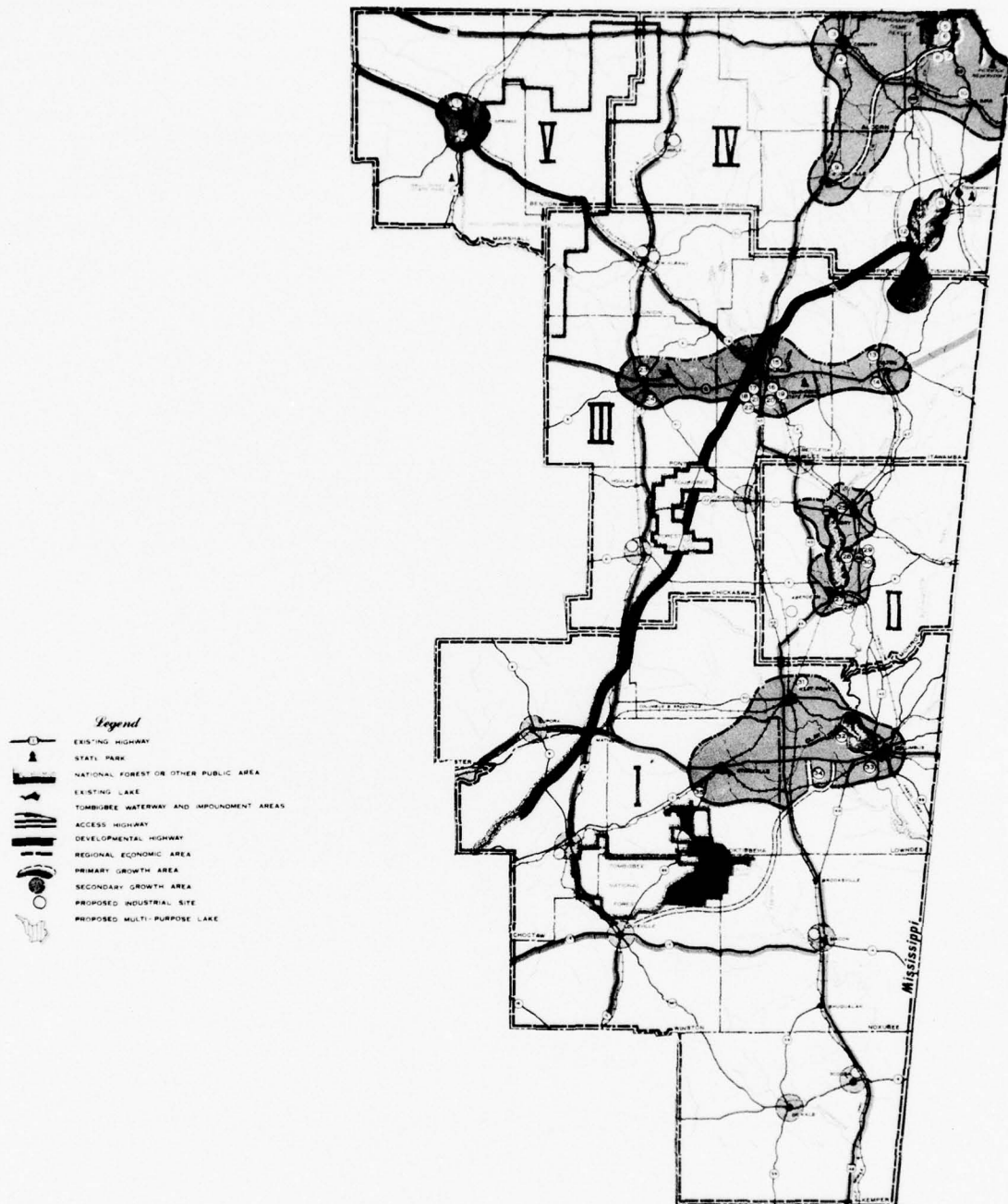
Population per worker is anticipated to decline over the forecast period toward an estimated national average of 2.58. However, since this area of Mississippi has had higher population per worker ratios historically, the rate of decline was assumed to be less than that of the Nation, reaching only 2.78 by the year 2020. This figure indicates a population forecast of 1,392,000 persons.

Increases in per capita income, as shown in Table 2, do not equal the assumed growth pattern for the Appalachian Region (95 percent of the Nation by 2020) in either the O.B.E. Forecast, or Developmental Benchmarks. In the latter, which was the higher of the two projections, Mississippi Appalachia achieved only 81 percent of the Nation (\$6,310 per capita), and this assumed early development of the Tennessee-Tombigbee Waterway. If the Waterway is not developed, industries which depend upon this type of facility for transportation and other water-related needs will not come to the Area; thus, per capita income figures can be expected to be lower.

Mississippi Appalachian Area Development Plan

The total development plan for the 20 Mississippi Appalachian counties is shown graphically in Figure 4. The Plan defines multi-county groupings (Regional Economic Areas), primary growth centers, secondary growth areas, and natural resource areas. Also, major facilities which tie the Area together are shown including the proposed Tennessee-Tombigbee Waterway, a developmental and major access highway system, and industrial and recreational development opportunities.

FIGURE 4
MISSISSIPPI APPALACHIAN AREA DEVELOPMENT PLAN



Primary Growth Areas. Regional Economic Areas are groups of counties centered around a primary growth area and may include several secondary areas. Primary growth areas are defined to be centers of commerce and industry which have significant potential for economic growth. Secondary growth areas include centers of commerce influencing small service areas and are the location of limited industrial activity. Natural resource areas include the remaining areas which are not either within a primary or secondary growth area. In natural resource areas, major endeavors toward economic growth will be related to agriculture, extractive industries, forestry and recreation.

Five primary growth areas have been defined within the 20-county Area. They include:

- Regional Economic Area I - The "Golden Triangle Area" of Columbus-Starkville-West Point
- Regional Economic Area II - The Amory-Aberdeen area in Monroe County
- Regional Economic Area III - The Pontotoc-Tupelo-Fulton corridor along State Highway 6 and U.S. Highway 78
- Regional Economic Area IV - The Corinth-Booneville-Iuka area which includes the proposed Yellow Creek port development and the recreation areas along Lake Pickwick Reservoir
- Regional Economic Area V - Holly Springs growth area, including two rural counties in the northwest sector of Mississippi Appalachia. (Holly Springs is near the Memphis, Tennessee metropolitan area and in the future will be influenced by the development of the Memphis area.)

Primary growth areas in Mississippi Appalachia will experience a majority of the future development and, for this reason, will be the areas where public investment will be concentrated. In order to prepare for this growth, plans for each of the five primary growth areas have been prepared. The plans are presented later in this

TABLE 2
MISSISSIPPI-IN-APPALACHIA
EMPLOYMENT-POPULATION AND INCOME FORECAST, 1980-2020
WITH HISTORICAL DATA, 1940-1960
(Office of Business Economics and Developmental Benchmark Forecast)

	1940		1950		1960		1980		2000		2020	
	Office of Business Economics Data						OBE	Benchmark	OBE	Benchmark	OBE	Benchmark
Total Personal Income (\$000's) ^{1/}	164,000	294,100	378,842				840,000	1,162,800	1,806,000	3,680,100	3,953,000	8,782,900
Total Earnings (\$000's)	145,476	240,885	311,945				675,000	960,200	1,482,000	3,029,000	3,332,000	7,227,400
Per Capita Income (\$'s) ^{1/}	359	690	940				1,711	1,948	2,927	3,699	4,985	6,310
Per Capita Relative to United States ^{2/}	30	42	47				54	61	59	74	64	81
Per Worker Earnings (\$'s) ^{1/}	1,035	1,720	2,327				4,044	4,730	6,852	8,654	11,712	14,455
Per Worker Relative to United States ^{2/}	37	49	55				61	71	68	85	75	92
Total Population	457,522	426,076	406,187				491,000	597,000	617,000	995,000	793,000	1,392,000
Population Per Worker	3.25	3.04	3.03				2.94	2.94	2.85	2.84	2.79	2.78
Total Employment	140,628	140,088	134,040				166,900	203,000	216,600	350,000	284,500	500,000
Agriculture	88,786	72,639	32,346				15,900	16,000	14,700	15,000	13,600	13,900
Mining	196	172	315				500	600	700	1,000	1,000	1,500
Construction	3,715	5,409	7,760				10,700	16,000	13,900	21,000	18,200	31,000
Manufacturing	11,883	16,758	33,597				57,000	70,000	75,000	125,000	99,000	175,100
Food	974	1,637	3,244				4,000	5,250	5,000	9,375	5,500	12,320
Textiles	495	767	565				1,000	700	1,000	3,125	1,000	5,200
Paper	4	0	0				0	1,120	0	3,850	0	6,160
Chemicals	210	370	464				1,000	1,190	1,000	8,125	1,000	13,200
Petroleum	12	0	0				0	70	0	125	0	176
Primary Metals	13	76	117				0	2,800	0	7,875	0	10,560
Transportation, Etc.	3,913	5,063	6,017				6,300	7,600	6,300	10,000	7,300	12,000
Trade	10,392	16,037	19,001				23,200	28,000	29,500	48,000	36,800	63,000
Finance, Etc.	776	1,151	1,924				3,100	4,000	4,200	11,000	5,300	16,000
Services	18,894	20,082	26,756				41,300	50,000	57,500	95,000	82,100	150,000
Public Administration	2,073	2,635	3,887				6,400	8,300	12,300	21,500	18,700	33,000
Armed Forces	0	142	2,437				2,500	2,500	2,500	2,500	2,500	2,500

^{1/} Total personal income, total earnings, per capita income and per worker earnings are in 1954 dollars.
^{2/} United States equals 100.

Source: Regional Economics Division, U. S. Office of Business Economics.
Mississippi Research and Development Center.

section of the report. First, however, the anticipated growth of the 20-county Area will be considered.

Forecast for Growth. During the 1940-1960 period, population and employment decreased in Mississippi Appalachia, as shown in Table 2. This was the result of an economy experiencing change from one based, in large measure, on agriculture to one balanced on agriculture and industry. In 1940, 88,786 persons were employed in agriculture, and only 11,883 were employed in manufacturing. By 1960, a balance of agriculture and industry had been achieved, with 32,346 persons in agriculture and 33,597 persons in manufacturing. In future years, as shown in Table 2, employment in manufacturing will far exceed that in agriculture. Also, substantial gains are expected in the services and government sectors of the economy.

During the 1960-1965 period, the decreasing employment trend experienced during the 1940-1960 period was reversed, with total employment in Mississippi Appalachia increasing from 134,040 to 139,774. Within this total, manufacturing employment increased from 33,602 to 39,428, and agricultural employment decreased from 32,346 to 30,910.

Benchmarks for development have been prepared for the Mississippi Appalachian Area and for the five regional economic areas within Mississippi Appalachia. These benchmarks serve as guides for estimating the growth and change expected in the economy of the Area during the 1960-2020 period. Two forecasts of growth are shown in Table 2. The O.B.E. (Office of Business Economics) forecast reflects a limited growth rate for the Area, and the Developmental Benchmarks indicate the opportunity for growth available to the Area. Chapter II of this report defines, in depth, the potential for industrial development available to the Area. Estimates of the growth potential for manufacturing form the basis for estimates of total employment indicated here. The estimates of total employment, in turn, reflect the growth of population of the Area and the growth of the service and government sector of the economy.

Total employment in 1960 equaled about 134,000 persons; forecasts of total employment indicate that the Area has a potential for 500,000 employees by the year 2020. In turn, based on a population per worker ratio of 2.78, the population of the Area will reach 1,329,000 by 2020. Individual worker earnings will reach 92.0 percent of the Nation's, or \$14,455, and per capita earnings will reach approximately 81.0 percent of the Nation's, or \$6,310.

These figures indicate substantial growth and levels of income which reflect productivity far above that now obtained in the Area. However, development of this magnitude can occur only if a strong economic development program is undertaken and if the communities of the Area provide the services needed for business, industry and the public.

II. WATER RESOURCE INVENTORY AND ANALYSIS FOR APPALACHIAN MISSISSIPPI

Mississippi Appalachian counties are within the Tombigbee River basin, with the exception of the northern tier of counties adjacent to the Mississippi-Tennessee line. These counties are partially within the Tombigbee River basin and partially within the river basin of several streams which flow north to the Tennessee River. All of the Mississippi Appalachian counties are within the headwater reaches of the streams that affect the Area and thus are subject to a wide variety of stream flows. During periods of little rainfall streams have low-flow characteristics and several run dry; during periods of heavy rainfall most streams are subject to flooding. Flooding along the streams, in the past, has caused extensive damage to crops and to property, particularly in urbanized areas.

Northeast Mississippi has an abundant supply of groundwater, however, as is the case in most areas of the United States, the groundwater is declining. In some sections of Appalachian Mississippi, the quality of groundwater is not satisfactory for a variety of reasons. In most areas good quality groundwater can be obtained if wells of sufficient depth are drilled. Groundwater is presently the principal source of water for municipal and industrial users. In a few cases, industries have not been attracted to the area due to the poor quality of the groundwater needed in their industrial process. The only city in the 20-county Area which does not use groundwater for municipal purposes is the City of Columbus. Columbus obtains its supply from Luxapalila Creek which runs through the City. However, good quality groundwater is available in the Columbus area.

Northeast Mississippi is deficit in opportunities for water-related recreation. Few, if any, large reservoir sites exist, but a variety of potentials for small reservoir development are available in the area. Construction of the Tennessee-Tombigbee Waterway will create a number of small reservoirs behind the lock and dam sites on the Tombigbee River and the man-made canal section of the waterway. These will contribute greatly to the area for outdoor and water-related recreation activities. The area also has several outstanding opportunities to develop wildlife areas which offer opportunities for hunting and fishing. This is particularly true in the headwater reaches of several streams. The Mackeys Creek Wildlife Area is one such facility now under consideration to be located in Prentiss and Tishomingo Counties.

Finally, navigation on the Tombigbee River is the principal water resource project likely to stimulate the economic development of Mississippi Appalachia. This project, connecting the north-flowing Tennessee River to the south-flowing Tombigbee River will open up

northeast Mississippi to industrial development on a scale similar to that of the Tennessee Valley. The Area already has the advantage of TVA power; with water navigation, most of the development advantages which have stimulated the growth of Tennessee Valley will be present in the counties subject to the influence of the Tombigbee.

Major Streams that Affect the Area

Tombigbee River

Characteristics. The Tombigbee River Drainage Basin covers most of the Mississippi Appalachian Area. The Tombigbee River is formed in Monroe County by the junction of its East and West Forks. It flows generally southward for 59 miles to Columbus, then southeasterly about 145 miles to Demopolis, Alabama, where it joins the Black Warrior River.

At low stages, the River varies from 75 feet in width at its source to 400 feet at Demopolis. The Tombigbee slopes are generally flat, averaging about 0.73 foot per mile from its source to Columbus, and 0.67 foot per mile from Columbus to Demopolis.

Principal tributaries of the Tombigbee (above the junction with the Black Warrior River) are its East and West Forks; the Buttahatchie, Tibbee, Sipsey, and Noxubee Rivers; and Luxapalila Creek.

Problems. In the Tombigbee River Basin, over one million acres of land are flooded each year, with flood damages exceeding \$7 million. The Tombigbee overflows an average of 2.5 times a year at Aberdeen and 1.5 times per year at Columbus.

Potentials. The Tombigbee River has development potential for Appalachian Mississippi as a navigable waterway and may well be the key link in overall development of the Area. The River, when linked to the Tennessee River, will provide an avenue for the shipment of seven million tons of cargo annually by 1976, the earliest year anticipated for project completion. By the year 2020, it is anticipated 27 million tons will be shipped, with an annual equivalent savings to the shipper of \$23 million. These figures do not include the ancillary effects of economic development in the Area, nor do they include the tonnage that will be shipped by existing or potential area industries. Also, the natural resources of the Area - timber, limestone, sand and gravel - could be utilized more fully if the Waterway were a reality.

The Tombigbee is the principal water resource of the Area. It has potential for navigation, water supply, industrial process and cooling water, and other similar developmental uses. Development of the River also will enhance opportunities for outdoor recreation,

FIGURE 5
MAJOR STREAMS THAT AFFECT THE AREA



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game and wildlife enjoyment, and employment during the construction phase of the project. These benefits alone are estimated to exceed \$5 million annually over a 50-year period.

Projects Underway and Planned. At present, no streams within the Mississippi Appalachian Area are navigable. The Tombigbee River, however, as a part of the authorized Tennessee-Tombigbee River Waterway Project, has potential for waterway development. The 1946 River and Harbor Act authorized a waterway to connect the Tennessee and Tombigbee Rivers by way of the East Fork of the Tombigbee River, Mackeys Creek and Yellow Creek. The plan for development of the waterway prepared by the Corps of Engineers (1962) is divided into three sections as follows:

1. River Section: 168 miles (9 by 300-foot channel) on the Tombigbee River from Demopolis, Alabama, to Amory, Mississippi, will include four locks (110 by 600 feet) and dams which will raise the water level from elevation 73 feet to elevation 190 feet above mean sea level.

Two locks and dams are to be located in the river section. The Columbus Lock and Dam will be immediately upstream from U.S. Highways 45 and 82 at Columbus. The Aberdeen Lock and Dam will be upstream from U.S. Highway 45 at Aberdeen.

Dredging will be required, principally in the upper reaches of each of the reservoir pools, to obtain authorized channel dimensions. Cutoffs are included to eliminate winding reaches of the River.

2. Canal Section: This section is 45 miles in length (12 by 300-foot channel) from Amory, Mississippi, to Bay Springs Lock and Dam. The canal will skirt the eastern edge of the valley of the East Fork of the Tombigbee River and Mackeys Creek and will be constructed partly by excavation and partly by levees. Five locks will have lifts ranging from 25 to 30 feet and will raise the water level from elevation 190 feet to elevation 330 feet. Lock "A" will be located upstream from State Highway 6 near Amory, and Lock "B" will be located near the Monroe-Itawamba County line. Other locks are to be located in Itawamba County.

3. Divide Section: This section is 40 miles in length (12 by 280-foot channel) from Bay Springs to the Tennessee River at Lake Pickwick Reservoir. Divide section locks will raise the water level from elevation 330 feet to elevation 414 feet, the normal level of Pickwick Reservoir, by means of an 84-foot normal lift structure. A 27-mile, deep-cut through the divide will have a maximum depth of about 175 feet.

Estimated cost of the project is \$325 million, of which \$298 million is federal cost for new work and \$27 million is nonfederal cost for relocations and bridge alterations. The most favorable cost-to-benefit ratio was estimated to be 1:1.7 for a 300-foot project with a 100-year project life.

East Fork of the Tombigbee River

Characteristics. The East Fork of the Tombigbee is formed by the junction of Mackeys and Brown's Creeks near Walkers Bridge in Itawamba County. It flows generally southward 65 miles to its junction with the West Fork of the River near Amory. The East Fork drains an area of 1,227 square miles approximately 20 miles wide and 65 miles long. The average slope of the East Fork is about 1.53 feet per mile and the stream varies in width from 40 to 200 feet.

Tributaries of the East Fork include Stanefer, Mantachie, Twenty Mile, and Big and Little Brown's Creeks. These streams rise in a hilly region of Mississippi Appalachia and are considered "flashy" streams subject to frequent overflow.

Problems. The average number of floods per year on tributaries of the East Fork is as follows: Big Brown's Creek (lower three miles), 8; Little Brown's Creek, 8; Twenty Mile Creek, 14; Mantachie Creek (lower reaches), 7; Mantachie Creek (upper reach), 5; and Stanefer Creek, 11.

Potentials. The potentials for improvement on the East Fork of the Tombigbee relate mainly to better drainage control, flood prevention and elimination of flood damage to agricultural areas, wildlife, hunting and outdoor recreation development. Only a minor part of overall damage estimated occurs in urban areas.

Most of the area in the upper reaches of the Tombigbee River Basin, including the East Fork and its tributaries, is subject to treatment by the Soil Conservation Service of the Department of Agriculture for financial and technical assistance under Public Law 566, the Watershed Protection and Flood Prevention Act. The benefit-to-cost ratio for structural measures under this program, 1:2.2, is favorable for the East Fork of the Tombigbee. Total project cost is estimated to be \$15.5 million, with federal cost of \$8.5 million and nonfederal cost of \$7.0 million.

Projects Underway and Planned. One existing Corps of Engineers' flood control project provides for the alleviation of floods in Itawamba County for a distance of 53 miles along the East Fork of the Tombigbee River, from Walkers Bridge at the junction of Brown's and Mackeys Creeks to the Monroe County line.

Improvements along the East Fork of the River, proposed by the Corps of Engineers, include Stanefer Creek, Mantachie Creek, Twenty Mile Creek, Big Brown's Creek and Little Brown's Creek. Total improvement costs are estimated to be approximately \$2.1 million, with a federal cost of \$1.8 million and a nonfederal cost of \$400,000.

All of these improvements are designed to improve the agricultural productivity of the area and reduce damage to crops and other property subject to the present flooding conditions.

The improvement of Stanefer Creek in Monroe County is proposed to begin at its outlet and extend upstream 6.1 miles. This work will consist of 2.25 miles of new channel and 3.85 miles of channel enlargement.

The proposed improvement of Mantachie Creek will consist of channel enlargement from its outlet upstream to river mile 2.0, and clearing and snagging between miles 2.0 and 5.0.

Flood protection projects on Twenty Mile Creek, in Lee and Itawamba Counties, will consist of channel enlargement from its outlet to river mile 11.4. Big Brown's Creek will be enlarged from its outlet, where it joins Mackeys Creek, upstream to river mile 2.7. Proposed improvements on Little Brown's Creek will consist of 7.6 miles of channel enlargement from its outlet upstream to mile 2.6 and a new channel from mile 2.6 to mile 7.6.

West Fork of the Tombigbee

Characteristics. The West Fork of the Tombigbee forms at the junction of Yanoba and Town Creeks, 3 miles north of Tupelo, Mississippi. It flows southeasterly 28.4 miles to its junction with the East Fork and drains an area of approximately 667 square miles. It has an average slope of 3.47 feet per mile, and width varies from 50 to 150 feet. The principal tributaries are Chiwapa, Tulip, Coonewah, Mud, Yanoba, and Town Creeks. They have average slopes of 3.15 to 5.30 feet per mile. These streams are also considered "flashy" and are subject to frequent flooding.

Problems. The West Fork floods an average of 5.0 times per year at the West Tupelo gauging station, and an average of 8.0 times per year at the North Nettleton gauging station. The area flooded is extremely valuable, consisting of good agricultural, urban and urbanizing land.

Potentials. A high water navigation project on the West Fork of the Tombigbee in Monroe and Lee Counties was authorized by the River and Harbor Act of 1882. However, only \$3,000 has been

expended on this project to date. The feasibility of such a project is not known, but development of navigation on this stream would further extend the benefits of Tombigbee navigation to the counties of Monroe, Chickasaw, Pontotoc and Lee.

Other benefits to the area affected by the West Fork (Old Town Creek) include the freeing of potential industrial land from flooding in the Tupelo area, and agricultural and other land development which can occur when flooding conditions are eliminated. Also, upstream reservoirs on the tributaries of the West Fork could provide domestic and industrial water should groundwater supplies ever prove to be inadequate.

Soil Conservation Service projects proposed on the West Fork of the Tombigbee River total \$13 million, with federal cost of \$7.2 million and non-federal cost of \$6.6 million. Corps of Engineers' projects total \$2.3 million, with \$1.9 million in federal cost and \$400,000 in nonfederal cost.

Improvements on the West Fork (Old Town Creek) will enhance large areas of potential industrial land adjacent to the city of Tupelo, in addition to agricultural land. These lands have strategic value in that they include prime industrial and other development areas in the center of the Tupelo-Fulton area. Also, there is the potential of navigation, as mentioned earlier.

Projects Underway and Planned. The improvement of the West Fork (Old Town Creek) will consist of a cutoff channel between miles 1.4 and 3.1. The channel will have a width of 90 feet, an average depth of 20 feet, and a slope of 2.0 feet per mile.

River and harbor improvements authorized for this stream provide for a high water channel from the confluence of Old Town Creek with the East Fork of the Tombigbee River to Tupelo and City Point, a distance of 30 miles. It is unlikely that additional funds will be appropriated for this project.

Buttahatchie River

Characteristics. The Buttahatchie rises in the northeastern part of Marion County, Alabama, where it is fed by springs and flowing wells. It flows southwesterly about 120 miles traversing an 862 square mile drainage area to join the Tombigbee River at mile 386.2, midway between the cities of Aberdeen and Columbus.

The stream slope averages about 2.3 feet per mile and channel widths vary from 60 to 100 feet.

Sipsey Creek, which drains an area of 237 square miles, is the principal tributary of the Buttahatchie River. It rises in the southwest corner of Marion County, Alabama, and flows southwesterly 25 miles to join the Buttahatchie near Gattman, Alabama, 39.7 miles above its mouth.

Problems. The Buttahatchie River floods an average of 7.4 times per year at Sulligent, Alabama, and an average of 4.6 times per year at Caledonia, Mississippi. The channel is very winding and badly choked with debris.

Potentials. The Buttahatchie River affects the development of a large portion of the Appalachian Area of Mississippi and Alabama. The River has a potential of navigation, reservoir development, water supply, recreation and pollution control. Coordinated planning for development between the states of Alabama and Mississippi through the Corps of Engineers should be undertaken to prove the merits of development using the new Appalachian criteria.

Projects Underway and Planned. Planned improvements consist of channel enlargement for the lower 69.0 miles of the stream and 3.2 miles of cutoffs.

Tibbee River

Characteristics. The Tibbee is formed by the junction of Line and Sakatonchee Creeks near the boundary of Clay and Oktibbeha Counties southwest of West Point, Mississippi. It flows easterly about 25 miles to join the Tombigbee River at river mile 372.8 about seven miles above the City of Columbus. The Tibbee drains an area of 1,121 square miles and has an average slope of about 1.52 feet per mile.

The major tributaries of the Tibbee River are Sakatonchee, Line and Catalpa Creeks. Sakatonchee Creek, the principal tributary, rises in the northwest corner of Chickasaw County about 12 miles north of Houston. It flows southerly for its full length of 50 miles and drains an area of 523 square miles; Houlka Creek, its principal tributary, joins it about 14.2 miles above the mouth.

Line Creek, the other principal headwater tributary of the Tibbee, rises in the western part of Clay County. It flows easterly about 25 miles to drain an area of 382 square miles; Johnson and Trim Cane Creeks are principal tributaries of Line Creek.

Problems. The Tibbee River floods an average of 4.2 times per year. Its principal tributary, Sakatonchee Creek, floods an average of 8.0 times in the lower reach, 11.0 times in the middle reach, and 6.0 times in the upper reach, annually. The other principal trib-

utary, Line Creek, floods an average of 5.0 times per year. Johnson Creek floods an average of 8.0 times per year, and Trim Cane Creek floods an average of 6.0 times annually. The third tributary of the Tibbee River, Catalpa Creek, floods an average of 9.0 times per year.

Potentials. The confluence of the Tibbee and Tombigbee Rivers is within the "Golden Triangle" area of Columbus-Starkville-West Point, Mississippi. The River forms the boundary between Clay and Lowndes Counties. The River, if properly developed in this area, can become the port terminus for a large industrial district benefiting the three counties and their principal cities. This development will also complement the proposed "Golden Triangle" Regional Airport development. It appears that, in this location, there is the potential for a large industrial district having access to air, water, highway and rail transportation. Other developmental advantages in this area include Mississippi State University with a strong engineering and scientific-technical orientation and planned vocational and technical training facilities.

Water resource development projects which will affect the development of the area include Soil Conservation Service projects totaling \$13 million, with a federal cost of \$6.1 million and a non-federal cost of \$6.9 million. Also, the Corps of Engineers proposes projects totaling \$7.4 million, with a federal cost of \$5.0 million and a nonfederal cost of \$2.4 million. These improvements should substantially improve benefits from agriculture in areas now subject to flooding.

Projects Underway and Planned. The flood protection plan for Sakatonchee Creek, a tributary of the Tibbee River, consists of a cutoff canal 8.8 miles from its mouth to mile 11.3 (as measured along the existing channel) and channel enlargement from stream miles 11.3 to 34.0.

The flood protection plan for Houlka Creek, a tributary of Sakatonchee Creek, consists of a cutoff canal 0.8 miles long to replace the abandoned channel improvement on the lower six miles of this stream. Channel enlargement will extend upstream from mile 0.8 along the planned channel to stream mile 22.5.

Improvements on Line Creek will consist of a new channel of 12.3 miles from its outlet to the confluence of North Canal and Johnson Creek.

The plan of improvement on North Canal, a tributary of Line Creek, consists of **channel enlargements** up to mile 5.8.

The improvement of South Canal, a tributary of Line Creek, consists of channel enlargement of 5.0 miles.

The improvement on Johnson Creek, a tributary of Line Creek, consists of channel enlargement from its outlet to mile 3.2.

Improvements on Trim Cane Creek, a tributary of Line Creek, will consist of channel enlargement and clearing from its outlet to mile 5.6.

The plan of improvement for Sun Creek, a tributary of Trim Cane Creek, consists of channel enlargement and clearing from its outlet to mile 5.3.

The improvement of Tibbee River will consist of clearing and snagging from its outlet to mile 3.0 and channel enlargement from miles 3.0 to 24.0.

Improvements for Catalpa Creek will consist of clearing and snagging from its outlet to mile 1.5, and a new channel between miles 1.5 and 11.0.

Noxubee River

Characteristics. The Noxubee River rises in central Oktibbeha County near Starkville, Mississippi. It flows southeasterly 135 miles through Noxubee County and into Sumter County, Alabama, to join the Tombigbee River at mile 282.8 just above the City of Gainesville, Alabama. The total drainage area is 1,400 square miles. The average slope of the river is 1.33 feet per mile. It varies in width from 30 to 100 feet.

Sand Creek, which rises in eastern Choctaw County, is the principal headwater tributary of the Noxubee. It flows easterly 25 miles and drains an area of 53 square miles. Another major tributary, which enters the Noxubee about 4.7 miles above its outlet, is Bodka Creek which rises in the northern part of Kemper County and flows easterly 30 miles and drains an area of 205 square miles.

Problems. The Noxubee River floods an average of 4.7 times per year at Allgoods Mill, Mississippi; 2.2 times per year at Macon, Mississippi; and 3.5 times per year at Geiger, Alabama.

Potentials. Navigation on the Noxubee River can bring about development of the natural resources (small aggregate, limestone, timber and pulp) of the counties in the southern portion of Mississippi Appalachia and other adjacent counties. A feasibility study to determine the extent of the resource potential should be undertaken. The navigation project, if feasible, can provide economic stimulus, flood control, water supply for industrial and domestic use, and recreational opportunities. Water-based recreation is limited in most areas of southern Mississippi Appalachia.

Projects Underway and Planned. Improvements along the Noxubee River planned for Noxubee County, Mississippi, and Sumter County, Alabama, consist of clearing and snagging from its outlet to river mile 105 and 1.1 miles of cutoffs in four short reaches in the vicinity of Macon.

The authorized Noxubee River navigation project provides for a channel for small river steamers during nine months of the year from the River's confluence with the Tombigbee River near Gainesville, Alabama, to Macon, Mississippi, or mile 50. The project, on which \$47,528 has been expended in the past, was authorized by the River and Harbor Act of 1880. It is unlikely that additional funds will be appropriated for the project.

Luxapalilia Creek

Characteristics. Luxapalila Creek rises in southern Marion County, Alabama, near the City of Winfield, Alabama. It flows southerly 32 miles through Fayette County, then westerly 21 miles through Lamar County, Alabama, into Lowndes County, Mississippi, then southerly 22 miles to join the Tombigbee River at river mile 364.1, just below the City of Columbus. It drains an area of 802 square miles.

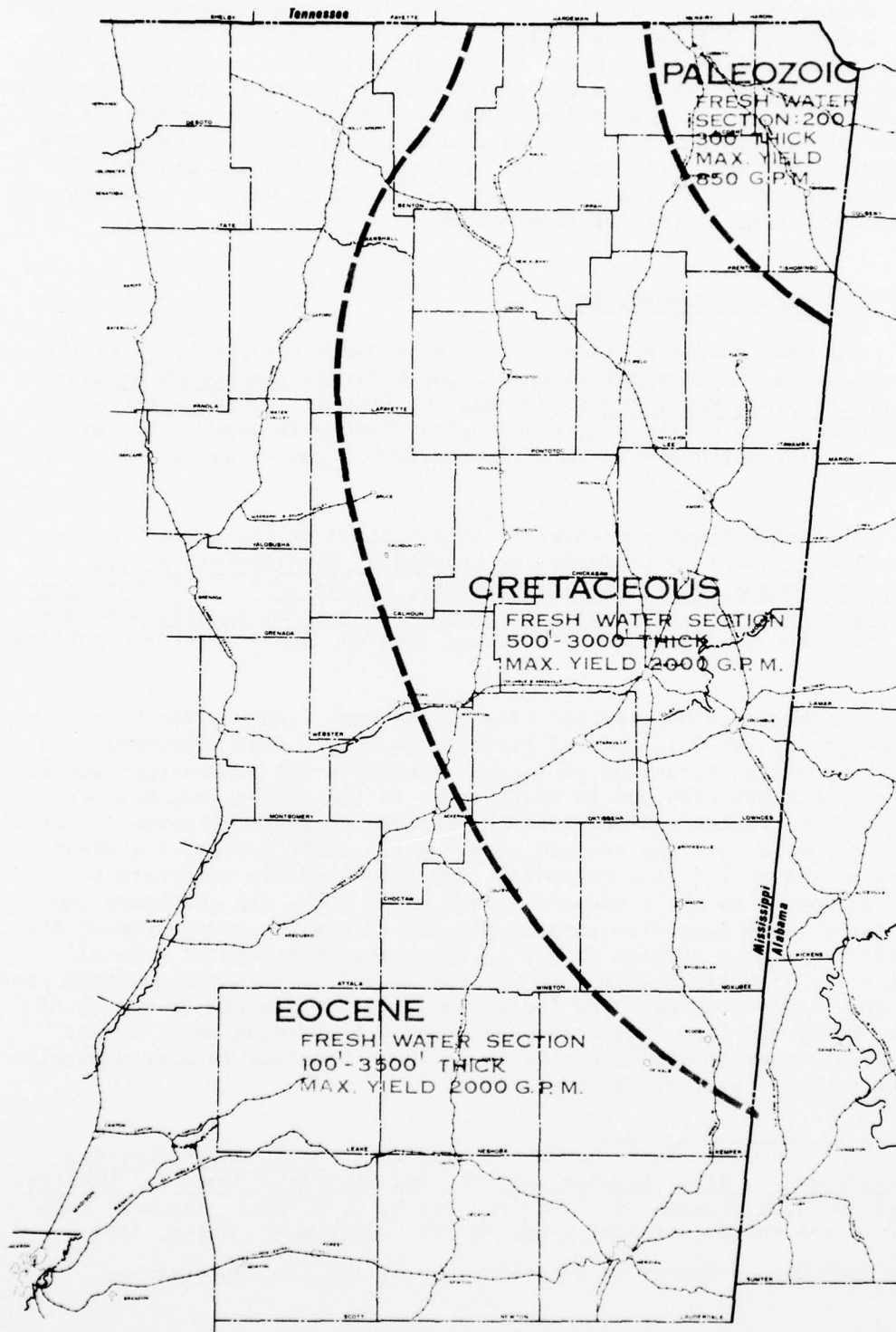
The principal tributary, Yellow Creek, with a drainage area of 365 square miles, joins Luxapalila Creek at river mile 15.6 near Steens, Mississippi. It rises in the northwest corner of Fayette County, Alabama, and flows generally southwest 40 miles.

Problems. Luxapalila Creek floods an average of 2.8 times per year at Steens, Mississippi. The lower end of the excavated canal on Luxapalila Creek is again filling with debris.

Potentials. The City of Columbus obtains its water supply from Luxapalila Creek. When the Corps of Engineers' flood control project planned for Luxapalila Creek is completed, there is doubt that Columbus will be able to continue to meet its water supply needs from this source. Also, with the growth potential forecast for the area, new sources of supply are likely to be required. The feasibility of a water supply reservoir to serve Columbus and the "Golden Triangle" area should be investigated, possibly to be located on Yellow Creek, a tributary of Luxapalila Creek. This project could be financed either by the Corps of Engineers, by the Department of Housing and Urban Development, the Soil Conservation Service, or jointly.

Projects Underway and Planned. Improvements planned for this stream include 19.2 miles of project work. The flood protection plan in the vicinity of Columbus on the lower reach from its outlet to river mile 5.6 (as measured along the improvement channel) will consist of 0.8 miles of cutoffs and 4.8 miles of channel enlargement.

FIGURE 6
MAJOR SOURCES OF GROUNDWATER



V-25-Miss

The channel will have a width of 60 feet, an average depth of 18 feet, and a slope of 3.1 feet per mile. The channel openings at six existing bridges will be enlarged. From river mile 5.6 to river mile 11.7, from the highway bridge at the Columbus Water Works to one-fourth mile below the outlet of Yellow Creek, the improvement will consist of 2.3 miles of cutoffs and 3.7 miles of channel enlargement. Improvements between river miles 11.7 and 15.1 will consist of a new channel; between river miles 15.1 and 19.2, the improvements will be reexcavation and enlargement of the existing channel.

Major Sources of Groundwater

The most recent publication on the groundwater resources of the northeastern Mississippi region is one entitled Cretaceous Aquifers of Northeastern Mississippi by Ernest H. Boswell. This report was prepared by the United States Geological Survey in cooperation with the Mississippi Board of Water Commissioners and is dated September, 1963.

The information presented in this section of the report is abstracted primarily from Water for Industrial Development in Clay, Lowndes, Monroe, and Oktibbeha Counties, Mississippi^{2/} and from Water Resource Inventory and Analysis of Appalachia-in-Mississippi,^{2/} both of which are based on data abstracted from the above-mentioned publication.

Northeastern Mississippi lies on the east flank of the Mississippi embayment of the Gulf Coastal Plain. The Mississippi embayment is a large synclinal structure whose axis parallels the Mississippi River. Paleozoic rocks crop out in small areas in the extreme northeastern part of the region and underlie the Cretaceous system elsewhere. Cretaceous rocks form the surface of all but a small part of the area east of the curved line extending from Kemper County northward to Tippah County on the Tennessee border. The rocks dip southward and westward, each formation passing beneath succeeding younger beds; the total Cretaceous section ranges in thickness from zero at several places in Tishomingo County to at least 3,500 feet in the southern part of the region studied. The Cretaceous section consists of strata of both Early and Late Cretaceous age. Early Cretaceous units do not crop out in Mississippi, but occur in the subsurface in approximately the southern half of the region.

^{2/} U.S.G.S., Water Resources Division. Water for Industrial Development in Clay, Lowndes, Monroe, and Oktibbeha Counties, Mississippi, by B. E. Wasson, H. G. Golden and M. W. Gaydos. Jackson: The Survey and the Mississippi Research and Development Center, 1965.

^{3/} Data prepared by Noblin Research, Jackson, Mississippi.

In ascending order, the Late Cretaceous rocks are divided into the massive sand and the Coker and Gordo formations of the Tuscaloosa Group; the McShan and Eutaw Formation, and Prairie Bluff Chalk, and Owl Creek Formation of the Selma Group. The Eutaw Formation is exposed on the surface or underlies most of the region. The distribution of the other units is less widespread.

The most widely used aquifer is in the Eutaw Formation. The massive sand of the Tuscaloosa Group is capable of the largest yields owing to its coarse texture and thickness, but it is of small areal extent. The Gordo Formation is the most important groundwater source of the present municipal and industrial supplies in the region; the McShan and Eutaw Formations also are large sources of such supplies. The Coffee Sand, and the McNairy Sand and Chiwapa Members of the Ripley Formation include important aquifers, but are restricted by facies changes.

All public industrial, and domestic water supplies are obtained from groundwater sources except the Columbus municipal supply which comes from Luxapalila Creek. Most of the supplies are from one or more of the Cretaceous formations except in the western half of the region where many shallow domestic wells and a few municipal wells are in the Tertiary formations, which overlie the Cretaceous.

Water from the Cretaceous aquifers in most of the region is soft and low in mineral content, but the aquifers in the Tuscaloosa Group in the eastern part contain water with excessive amounts of iron. Some aquifers in the northern counties yield moderately hard water, and hardness is characteristic of water obtained from parts of the Ripley Formation. Water in the aquifers becomes more highly mineralized with depth and also, in general, southward along the strike. Water from the Eutaw Formation along the southern and western periphery of the region is too highly mineralized for most uses. Mineralization decreases in successively deeper aquifers at any specific place in the southern counties. The massive sand, for example, which is the lowest Upper Cretaceous aquifer, yields water of the best chemical quality in the several counties where it occurs. Flouride is present, at least locally, in water from all Cretaceous aquifers and is consistently present in water from the Eutaw Formation. Locally the quantity of flouride is excessive, as much as 7 ppm (parts per million) in some places.

Artesian conditions exist in all Cretaceous aquifers, and flowing wells are common in low areas. Declining water levels have caused flow to cease in some places. Increased pumping for municipal and industrial supplies has resulted in lowering of water levels locally, but the situation is not yet serious; at the present time water is not "mined" or overdeveloped in any part of the region. Large reserves of groundwater remain to be developed.

Substantial flows of water of excellent chemical quality from the eastern tributaries to Tombigbee River sustain most of the low flow of the river and represent a valuable resource that can be developed. The City of Columbus now uses an average of about 2.5 million gallons of water per day from Luxapalila Creek, one of these tributaries.^{4/}

Recreation

The total acreage in the Mississippi Appalachian Area devoted to recreation approaches 443,000 acres. Four state parks are located in the Area: Wall Doxey in the central portion of Marshall County; J. P. Coleman State Park in the extreme northeastern portion of Tishomingo County; Tishomingo State Park in the south central portion of Tishomingo County and Tombigbee State Park on the county line between Itawamba and Lee Counties. Two national forests are located within the Area: Holly Springs National Forest in Benton, Marshall, Union and Tippah Counties; and Tombigbee National Forest in Chickasaw, Winston and Choctaw Counties. Fourteen recreational areas within these two national forests serve adjacent counties.

State Game and Fish Lakes serving the Area include: Dumas Lake in Tippah County; Lee Lake north of Tupelo; Monroe Lake south of Amory; and Lowndes Lake in Lowndes County. The Choctaw Wildlife Management Area in Choctaw County and the Dancing Rabbit Creek Wildlife Management Area in Noxubee County provide exceptional hunting opportunities.

Two national battlefield sites and a fish hatchery are located in Lee County. Columbus Air Force Base, north of Columbus, contains a military recreational area. Also located in the southern portion of the Area is Nanih Waiya Historic Site in Winston County and Noxubee National Wildlife Refuge at the confluence of Oktibbeha, Noxubee and Winston Counties. Providing historical and recreational value to the Area, as well as access, is the Natchez Trace Parkway extending from southwest to northeast across the Area. Although somewhat removed from major populous areas, Pickwick Lake offers a wide variety of water-related activities.

A series of three dams to be located on the Tombigbee River - one near Tishomingo in Tishomingo County, one near Aberdeen in Monroe County, and the third near Columbus in Lowndes County - will offer excellent potential for development of water-related activities around the reservoirs created by the three dams. Also, Town Creek and the Noxubee River offer excellent potential for water-related recreation

^{4/} U.S. Geological Survey, Water Resources Division. Water for Industrial Development in Clay, Lowndes, Monroe, and Oktibbeha Counties, Mississippi, by B. E. Wasson, H. G. Golden, and W. W. Gaydos. Jackson: The Survey and the Mississippi Research and Development Center, 1965.

facilities. These rivers and other smaller streams, if cleared and dammed, can provide needed and convenient recreational opportunities.

A detailed analysis of projected needs for recreational land was undertaken for each county in Mississippi Appalachia. The anticipated demand for playgrounds; neighborhood parks, playfields, community, district, and regional parks was established based on minimum standard acreage requirements per thousand population as indicated in "News and Trends in City Development" (Urban Land Institute, May, 1961.) The above recommended land uses are consolidated into three categories - neighborhood, community and district-regional.

Neighborhood facilities are those serving an area which is also served by one elementary school, usually bounded by a natural or man-made barrier and a population of 3,000 to 5,000 persons. Community facilities encompass several neighborhoods served by one high school, bounded by natural or man-made barrier and containing a population of 30,000 to 50,000 persons. District or regional recreation facilities serve an area of two or more communities with a population normally exceeding 75,000.

Within Mississippi Appalachia, 24,239 acres will be required to serve the outdoor recreation needs of nearly 1.4 million people residing in the Area by the year 2020. In order to acquire and develop this land, an investment of \$93.7 million is warranted.

Land acquisition costs vary from \$300 to \$400 per acre for neighborhood recreation facilities to as low as \$100 per acre for district and regional facilities in many Mississippi Appalachian counties. The cost to develop the acquired acreage likewise varies from \$8,000 per acre for neighborhood facilities to \$10,000 per acre for community facilities to \$1,000 per acre for district or regional recreation facilities. The development cost includes such items as landscaping, playground equipment, lavatory and parking areas, but does not include the cost of large structural facilities such as community centers or museums.

Of the total \$93.7 million investment in recreational facilities, \$15.6 million, or 16.6 per cent, is earmarked for use prior to 1980. In each succeeding 20-year increment, an additional \$39.1 million will be needed. Approximately 6.5 per cent of the total investment in recreation facilities is designated for land acquisition. The total investment in neighborhood recreation facilities is \$39.8 million, while community facilities will cost \$34.7 million.

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III. WATER RESOURCE PROJECTS AND EVALUATION PROCEDURE

The following procedure was used to determine the projects recommended. First, all of the projects specifically set out in An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi were tabulated according to priority and location; to this list were added the results of a survey of Federal, State, regional and local agencies which have a responsibility for the development of water resources in the Mississippi Appalachian Area. Representatives of each agency were asked to provide information about projects which are planned or proposed for the Mississippi Appalachian area within their jurisdiction. Also, all of the city and county governments in the 20-county area were asked to provide information on projects which they proposed to be included in the study. A master project list was then compiled, and priorities were assigned according to the following criteria:

1. Projects essential to achieving the State's goals of economic development are given high priority.
2. Projects which would contribute to the overall development of the primary growth areas of the 20-county area, in keeping with the provisions of PL 89-4, The Appalachian Regional Development Act of 1965, are given high priority.

All other projects were evaluated on the basis of the reasonableness of the proposal and on the study time needed to justify their being included in a priority work program. A general discussion of prior studies and the status of present studies has already been given in the water resource inventory of Section II.

Priority ranking of projects in many instances does not reflect the immediate need for such projects but does indicate the importance of the projects in the long-range development of water resource potentials. Regional recreation areas throughout Appalachian Mississippi, therefore, are not vital in the short range or immediate future but are key elements of the overall plan for development and, as such, received high priority ranking. A number of projects, however, are of such immediate need that the benefit of their early completion increases their priority ranking.

The project proposal of groupings by water use is for convenience and not intended to imply use priorities. e.g., all municipal needs need not take precedence over all other needs.

Cooperating agencies are listed in Section VI.

Communities with Major Flood Problems

The communities shown in Figure 7, and listed in Table 3 below, have major flooding problems. It is recommended that the U.S. Army Corps of Engineers, U.S. Department of Agriculture, Soil Conservation Service, and other federal and state agencies which have programs to eliminate flooding, should consider these communities and the streams affecting them as high priority projects.

TABLE 3

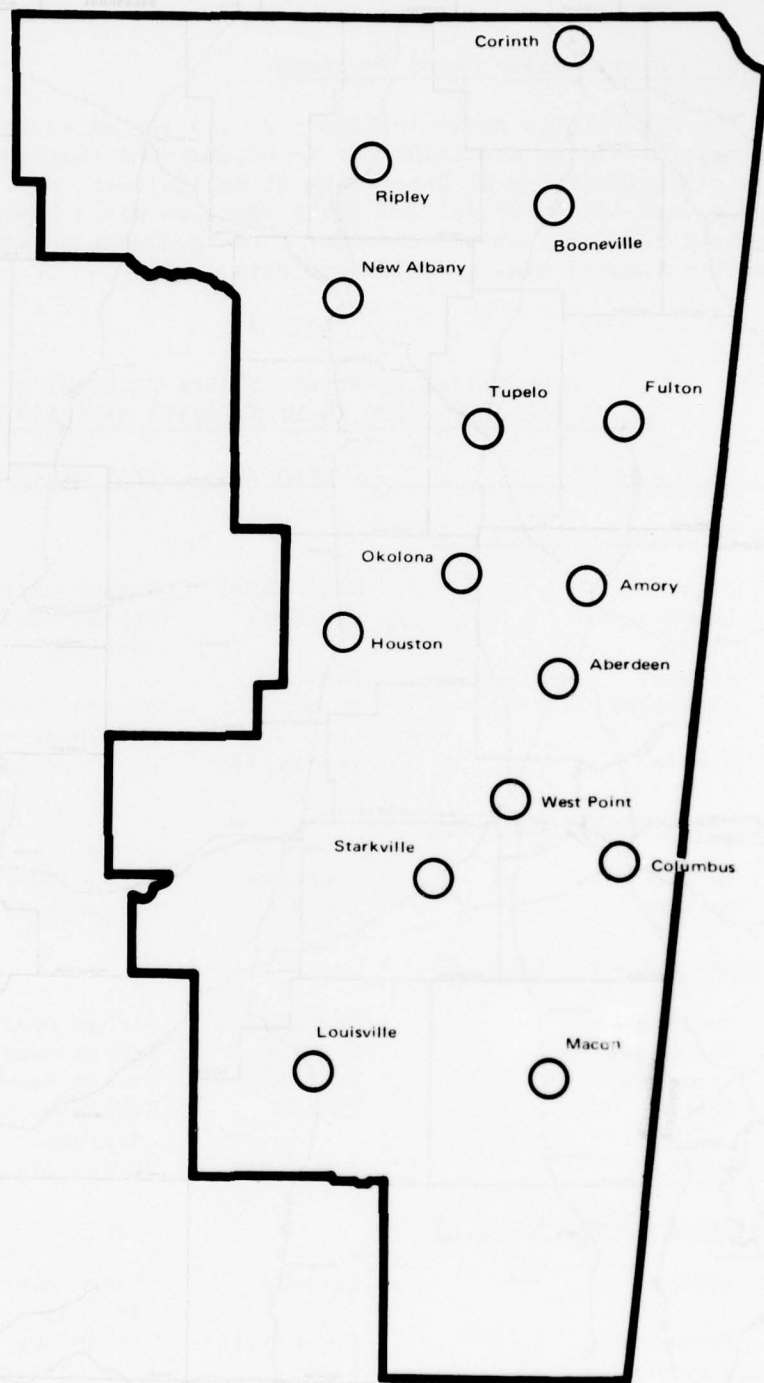
COMMUNITIES (POPULATION OVER 2500) WITH MAJOR FLOOD PROBLEMS IN MISSISSIPPI APPALACHIA

<u>County</u>	<u>Community</u>	<u>Type of Flood Problem</u>
<u>Regional Economic Area I^{*/}</u>		
Clay	West Point	Stream overflow
Lowndes	Columbus	Stream overflow, local drainage
Noxubee	Macon	
Oktibbeha	Starkville	Stream overflow, local drainage
Winston	Louisville	Local drainage
<u>Regional Economic Area II</u>		
Monroe	Aberdeen	Stream overflow
Monroe	Amory	Stream overflow
<u>Regional Economic Area III</u>		
Chickasaw	Okolona	Stream overflow
Chickasaw	Houston	Stream overflow
Itawamba	Fulton ^{**/}	Stream overflow
Lee	Tupelo	Stream overflow, local drainage
Union	New Albany	Stream overflow
<u>Regional Economic Area IV</u>		
Alcorn	Corinth	Stream overflow, local drainage
Prentiss	Booneville	Stream overflow
Tippah	Ripley	Local drainage

*/ Less than 2500 population.

**/ A map of regional economic areas is shown on page V-4-Miss

FIGURE 7
COMMUNITIES WITH MAJOR FLOOD PROBLEMS



Proposed Municipal Water Systems and Rural Water Associations

Segments of the population of Mississippi-in-Appalachia depend on wells or other sources of water supply which are uneconomical and are often unsanitary. In many cases municipal water supply and distribution systems have become obsolete and are inadequate to handle domestic and industrial requirements. The total investment required in the area for construction of water distribution systems and treatment facilities by the year 2020 will be \$289.1 million. This investment will be needed to meet the domestic requirements of the population of Mississippi Appalachia.

The proposed municipal water systems and rural water associations shown in Tables 4 and 5 are necessary steps toward upgrading Mississippi Appalachia to a desired level of service and preparing the area for future expected growth.

TABLE 4
MUNICIPAL WATER SYSTEMS

<u>County</u>	<u>City</u>	<u>Priority Status</u>
Kemper	DeKalb	Priority
Kemper	Scooba	Priority
Noxubee	Brooksville	Priority
Noxubee	Macon	Priority
Noxubee	Shuqualak	Priority
Choctaw	Weir	Priority
Oktibbeha	Sturgis	Priority
Oktibbeha	State College	High Priority
Oktibbeha	Starkville	High Priority
Lowndes	Artesia	High Priority
Lowndes	Columbus	High Priority
Monroe	Hatley	Priority
Lee	Shannon	Priority
Lee	Guntown	Priority
Union	Myrtle	Priority
Benton	Hickory Flat	Priority
Tippah	Ripley	Priority
Tippah	Walnut	Priority
Alcorn	Corinth	High Priority
Tishomingo	Iuka	High Priority

Parks

Tishomingo	Tishomingo State Park	Priority
Tishomingo	J. P. Coleman State Park	Priority

FIGURE 8
PROPOSED MUNICIPAL WATER SYSTEMS AND RURAL WATER ASSOCIATIONS

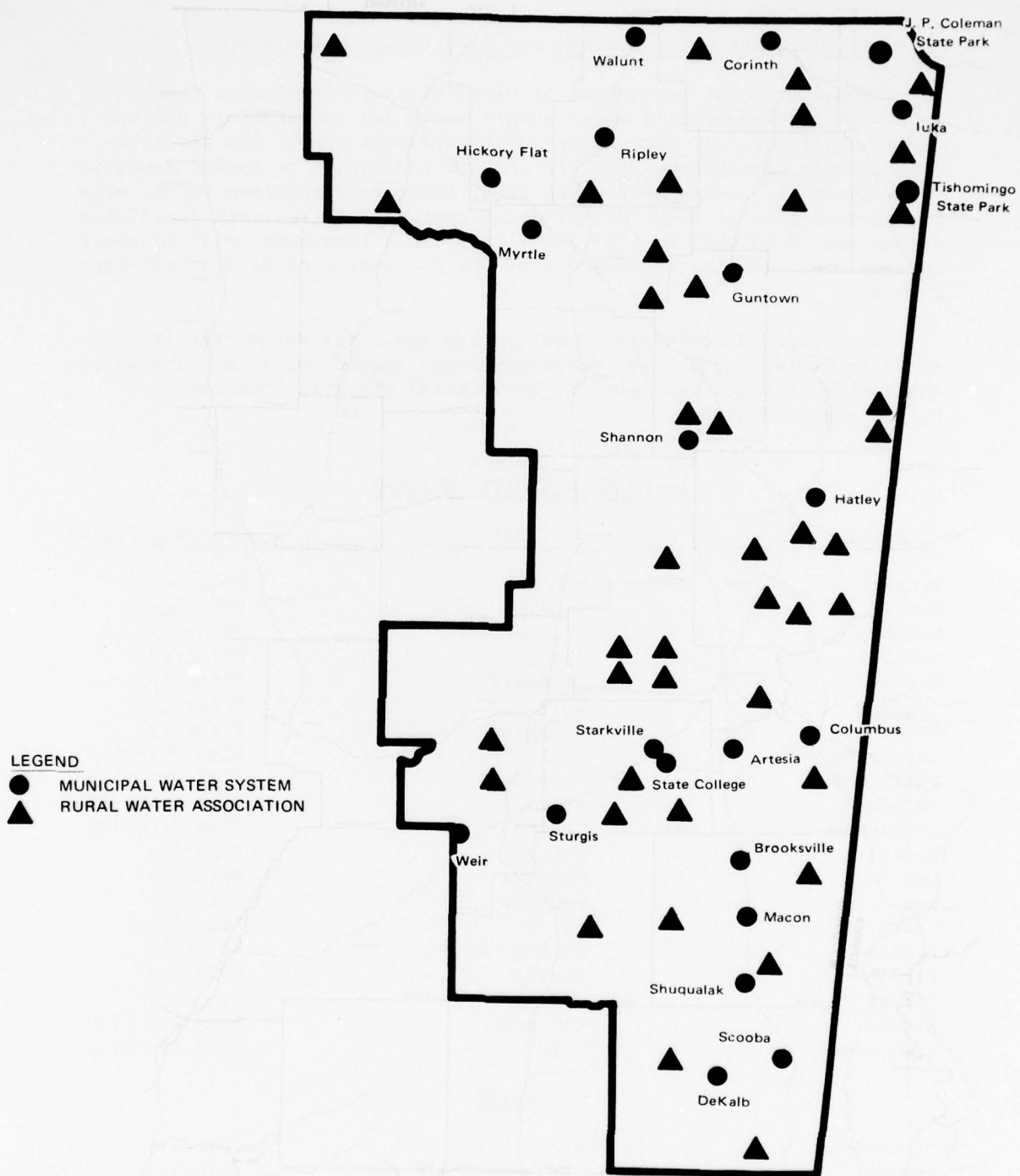
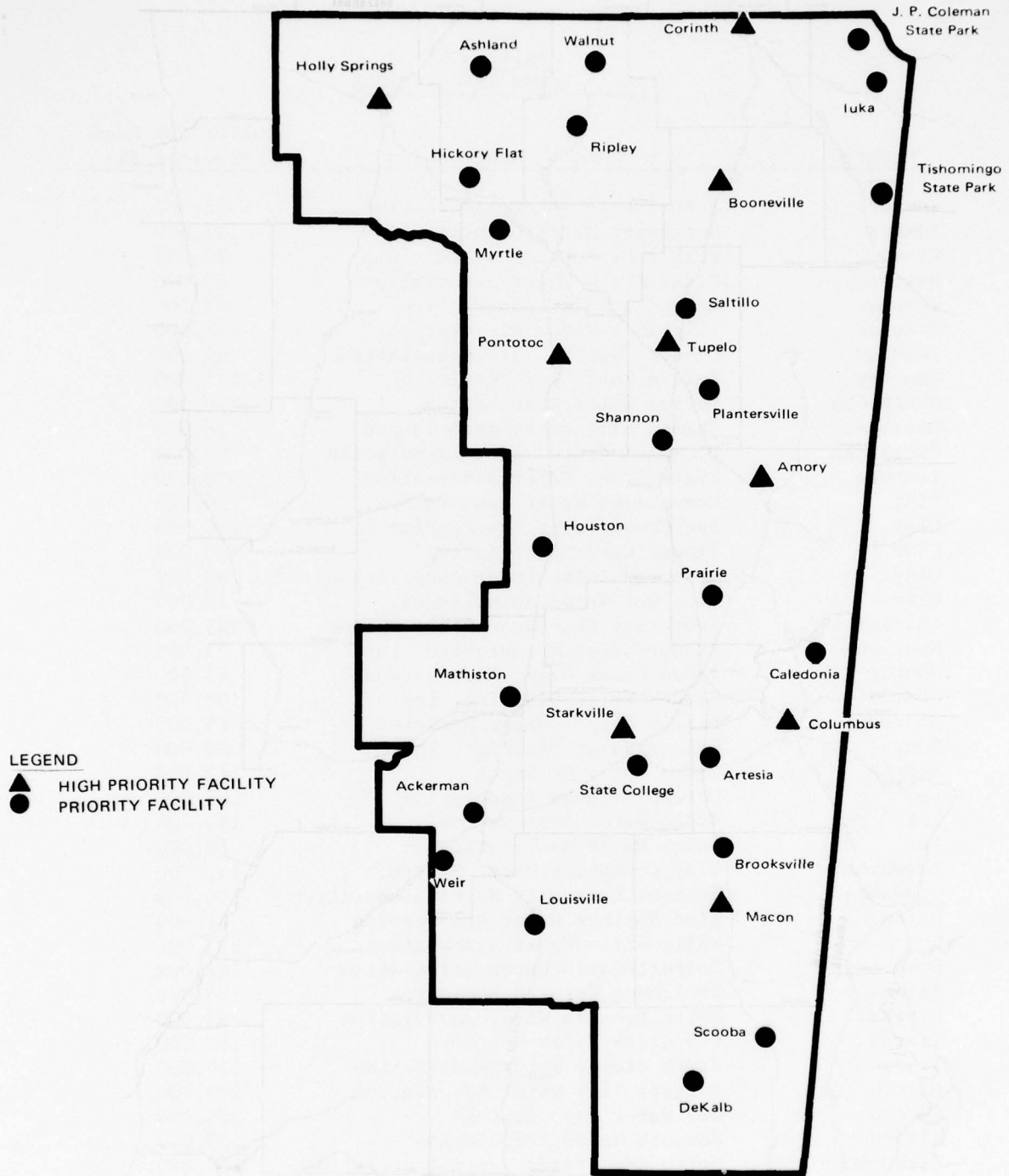


TABLE 5
RURAL WATER ASSOCIATIONS

County	Name of Association	Application Funds Requested (\$)
Kemper	Porterville Water Association	72,000
Kemper	Northwest Water Association	173,000
Winston	Pugh's Mill Water Association	70,000
Noxubee	Cedar Creek Water Association	60,000
Noxubee	Magnolia Water Association	67,000
Noxubee	Pilgrim's Water Association	150,000
Choctaw	Chester Water Users Association	60,000
Choctaw	Reform Water Association	125,000
Oktibbeha	Bethel Water Association	70,000
Oktibbeha	Chapel Hill Water Association	26,000
Oktibbeha	Pleasant Grove Water Association	65,000
Lowndes	Black Creek Water Association	300,000
Clay	Montpelier Water Association	50,000
Clay	Sun Creek Water Association	110,000
Clay	Tibbee Water Association	90,000
Clay	Westwood Improvement Association	40,000
Clay	Lone Oak Water Association	70,000
Chickasaw	Southeast Chickasaw Water System	125,000
Monroe	Athens Water Association, Inc.	35,000
Monroe	James Creek Water Association	41,000
Monroe	Becker Water District, Inc.	100,000
Monroe	Pearce Chapel Water District	65,000
Monroe	Quincy Water District, Inc.	49,000
Monroe	Cason Water District	112,500
Lee	Chiwappa Water Association	140,000
Lee	Ridge Water Association	180,000
Lee	Union Water Association	80,000
Itawamba	Clay Community Water System	145,000
Itawamba	Tremont Community Water Association	150,000
Union	Blue Springs Water Association	87,000
Union	Wallerville Water Association	315,000
Prentiss	Holcutt-Cairo Water Association	281,000
Marshall	Chulahoma Water Association	65,000
Marshall	North Byhalia Water Association	92,000
Tippah	Dry Creek Water System	160,000
Tippah	South Ripley Water Association	110,000
Alcorn	Biggersville Water Association	150,000
Alcorn	OSG Water Association	225,000
Alcorn	Kossuth Water Association	100,000
Tishomingo	North Crossroads Water Association	185,000
Tishomingo	Paden Water System Association	68,000
Tishomingo	Short-Coleman Park Water System	134,000

FIGURE 9
PROPOSED MUNICIPAL SEWAGE FACILITIES



Proposed Municipal Sewage Facilities

Forty-six communities in Mississippi Appalachia are completely without or lack adequate sewage treatment facilities and many other communities have inadequate sewage collection systems. The study, An Evaluation of Water-related Economic Resource Development of Appalachia-in-Mississippi, indicates a need for future investment in sewage treatment and collection facilities of \$223.1 million by 2020, and this figure does not include treatment facilities for industrial wastes. The cost for industrial treatment facilities will be borne by the industries involved.

Table 6 below and Figure 9 indicate the need for investment in sewage collection and treatment facilities within the twenty-county Mississippi Appalachian Area.

TABLE 6
HIGH PRIORITY SEWAGE FACILITY RECOMMENDATION

County: Oktibbeha

City: Starkville
Urban Area

Project Description:

The City of Starkville estimates that about \$75,000 is needed to repair the existing sewage collection system and install new lines needed to accommodate urban expansion in the near future. Also, sewage treatment facilities are inadequate to handle present domestic and future industrial waste loads. Estimates of cost for sewage treatment plant expansion are \$100,000.

- - -

County: Lowndes

City: Columbus
Urban Area

Project Description:

Presently, the City of Columbus is providing sewage treatment to an area east of Luxapalila Creek with a 17-acre lagoon. The State Board of Health finds this facility to be inadequate and has recommended that it be supplemented by an additional lagoon. Estimates of cost for this facility are \$220,000.

- - -

TABLE 6 (Cont'd.)

County: Monroe

City: Amory
Urban Area

Project Description:

A sewage treatment plant and collection system are needed in Amory to control stream pollution and prevent a public health nuisance from developing. No cost estimates are available.

- - -

County: Pontotoc

City: Pontotoc
Urban Area

Project Description:

A sewage treatment plant and collection system are needed in Pontotoc to reduce stream pollution and prevent a public health nuisance from developing. The construction of five small lagoons for sewage collection and treatment are recommended to be located at the outer edges of the City, occupying a total water area of approximately 29 acres. No cost estimate is available.

- - -

County: Lee

City: Tupelo
Urban Area

Project Description:

Additions to the present sewage collection system are needed in Tupelo to prevent a public health nuisance from developing. No cost estimates are available.

- - -

County: Prentiss

City: Booneville
Urban Area

Project Description:

Sewage treatment facilities and collection system are needed in Booneville. Residential and industrial growth has continued at a rapid pace, with few improvements in sewage facilities, thereby creating a public health nuisance and increased stream pollution. No estimates of cost are available at this time.

- - -

County: Alcorn

City: Corinth
Urban Area

Project Description:

This project consists of extensions of the present sewage collection

TABLE 6 (Cont'd.)

(Alcorn County cont'd.)

system and proposed oxidation ponds for sewage treatment. The project can be partly funded by the Department of Housing and Urban Development, with the State and City sharing costs. No estimate of cost is available at this time.

County: Marshall

- - -
City: Holly Springs
Urban Area

Project Description:

A sewage treatment plant and collection system adequate to maintain public health standards and control stream pollution is recommended for the City of Holly Springs. No cost estimates are available at this time.

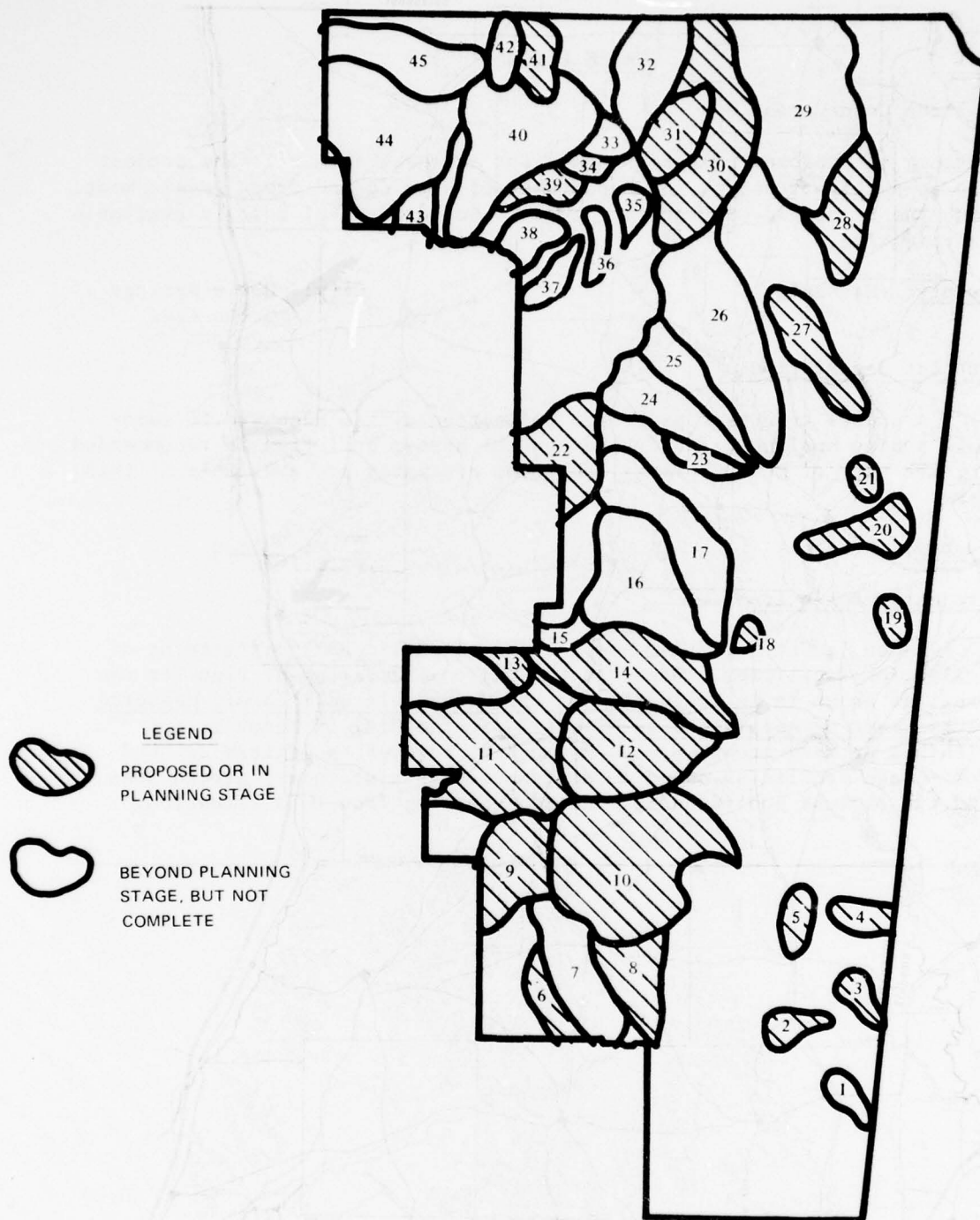
County: Noxubee

- - -
City: Macon

Project Description:

Macon, a City of 2,500 people, has no public sewage treatment or collection facilities. Based on the Regional Development Plan for the area, as shown in An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi, the City of Macon is not within a primary growth area. Macon has, however, a legitimate need for sewage facilities based on designation as a secondary growth area and the obvious public health hazard resulting from this situation.

FIGURE 10
WATERSHED DEVELOPMENT PROJECTS



Source: U. S. Department of Agriculture,
Soil Conservation Service.

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Mississippi Research and Development Center

TABLE 7
OTHER PRIORITY SEWAGE FACILITY RECOMMENDATIONS

Kemper	DeKalb	Sewage Treatment Plant & Collection System
Kemper	Scooba	(Same)
Noxubee	Brooksville	"
Winston	Louisville	"
Choctaw	Weir	"
Choctaw	Ackerman	"
Webster	Mathiston	"
Lowndes	Artesia	"
Lowndes	Caledonia	"
Lowndes	Crawford	"
Monroe	Prairie	Industrial Park Sewage Treatment Facilities
Chickasaw	Houston	Sewage Collection System (only)
Lee	Saltillo	Sewage Treatment Plant & Collection System
Lee	Shannon	(Same)
Lee	Plantersville	"
Union	Myrtle	"
Tippah	Ripley	"
Tippah	Walnut	"
Tishomingo	Iuka	"
Benton	Ashland	"
Benton	Hickory Flat	"

Parks

Tishomingo	Tishomingo State Park	Sewage Treatment Plant & Collection System
Tishomingo	J. P. Coleman State Park	(Same)

Watershed Development Projects

The Watershed Project Areas shown in Figure 10 depict planning areas for total water resource conservation defined by the drainage area of a major or minor stream.

With the passage of Public Law 566 in 1954 (Watershed Protection and Flood Prevention Act) upstream areas of streams and rivers (not to exceed 250,000 acres) became eligible for federal assistance including strengthened conservation measures such as flood control, water storage, and soil conservation.

Currently twenty watershed projects are in the advanced planning stage or under construction in Mississippi Appalachia. An additional twenty-five projects have been proposed by the Soil Conservation Service,

many of which are authorized with preliminary planning underway.
Table 8 below indicates the Watershed Development programs underway in the twenty-county area and the project status or recommended priority.

TABLE 8
WATERSHED PROJECTS

<u>Watershed</u>	<u>Map ID</u>	<u>Project Status and Priority</u>
Shammack Creek	1	Advanced planning or construction
Shuqualak Creek	2	Priority
Woodward Creek	3	Priority
Bogue Chitto Creek	4	Priority
Horse Hunter Creek	5	Priority
Noxapater Creek	6	Priority
Tallahaga Creek	7	Advanced planning or construction
Nanaway Creek	8	Priority
Yockanookany River (Upper reaches)	9	Priority
Upper Noxubee River	10	High Priority
Big Black River (Upper reaches)	11	Priority
Trim Cane and Sun Creeks	12	High Priority
Sabougla Creek	13	Priority
Line Creek	14	High Priority
Topisaw Creek	15	Priority
Houlka Creek	16	Advanced planning or construction
Chookatonchee Creek	17	(Same)
Anderson Branch and Cane Creek	18	Priority
Running Slough and Maple Creeks	19	Priority
Weaners Creek	20	Priority
Mill Creek	21	Priority
Skuna River (Upper reaches)	22	Priority
Tubbalubba Creek	23	Priority
Chiwapa Creek	24	Priority
Coonewar Creek	25	Priority
Town Creek	26	Advanced planning or construction
Mantachie Creek	27	High Priority
Browns Creek	28	High Priority
Tuscumbia River	29	High Priority
Big Hatchie River	31	Priority
Muddy Creek	32	Priority
North Tippah Creek	33	Priority
South Tippah Creek	34	Priority
Cane Creek	35	Priority
Hell Creek	36	Priority
Locks Creek	37	Priority
Mill Creek	38	Priority
Oakannatie Creek	39	Priority
Lower Tippah River	40	Priority

TABLE 8 (Cont'd.)

Watershed	Map ID	Project Status and Priority
Roberson Creek	41	Priority
Grays Creek	42	Priority
Little Spring-Ochewalla Creeks	43	Priority
Pigeon Roost Creek	44	Priority
Coldwater River	45	Priority

The Tennessee-Tombigbee Waterway Project

The Tennessee-Tombigbee Waterway Project is a key link in the total economic and related water resource development of the Mississippi Appalachian Area. The project consists of the construction of a waterway extending the existing canalized Black Warrior-Tombigbee Waterway upstream via the Tombigbee River, East Fork of the River, Mackeys Creek, a deep cut through the divide into Yellow Creek, and finally into the Tennessee River near the common boundary of the States of Mississippi, Alabama and Tennessee. The project was authorized by the River and Harbor Act approved in 1946, Public Law 525, of the Seventy-ninth Congress, 2nd Session. The general plan of improvement was revised in 1962 to authorize development and utilization of recreational resources. In 1965 the Public Works Appropriation Act included an item that authorized reevaluation of the economics of the project. Also, a study of the feasibility of nuclear or conventional excavation through the Bear Creek Divide was then compared to the feasibility of conventional excavation through the Yellow Creek Divide, also in Tishomingo County.

Construction Cost. The estimated construction cost of the Tennessee-Tombigbee Waterway Project is shown in Table 9. These include all federal and non-federal costs to result from construction of the project shown for 200-foot and 300-foot project channel widths. These widths were selected according to the engineering characteristics of the project and analysis of the barge traffic factors prevailing, considering the Tennessee-Tombigbee versus the Mississippi River alternate routes. Benefit estimates were developed by the Corps of Engineers, considering these alternate widths, based on the utilization of larger tows. It was estimated that the total construction cost for the 200-foot channel would be approximately \$294 million, and that the 300-foot channel would cost \$325 million. Annual charges are also indicated in Table 9 for the two alternate channel widths assuming a 50-year and 100-year life for the project.

Annual charges were calculated on the basis of a 3 1/8 percent interest rate and on a nine-year construction period for both the 200-

FIGURE 11
TENNESSEE-TOMBIGBEE WATERWAY



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foot and 300-foot project. It was estimated that the annual cost for the 50-year life would be \$15 million for the 200-foot project and \$17 million for the 300-foot project. Based on a 100-year life for the project the 200-foot channel would cost \$13 million annually and the 300-foot channel, \$14 million annually.

Benefits. Estimates of the average annual equivalent benefits for the Tennessee-Tombigbee project are shown in Table 9. These benefits include navigation savings, recreation, fish and wildlife, and area redevelopment benefits. They do not include any of the developmental (or expansion) benefits associated with economic stimulation of the Mississippi Appalachian Area resulting from the construction of the Waterway project. Average annual benefits for a project with a 50-year life were estimated to be \$16 million for the 200-foot channel width project and \$21 million for the 300-foot channel width project. Based on a 100-year project life, the average annual benefits were estimated to be \$19 million for the 200-foot channel width project and \$23 million for the 300-foot channel width project. The estimated benefits result in all cases primarily from savings in navigation cost based on estimated tonnage to be shipped on the Waterway.

Benefit-to-Cost Ratios. Table 9 shows the benefit-to-cost ratios derived from the various channel widths and project life assumptions. Based on the ratios shown in the table, and on other considerations, the District Engineer concluded that "the most practicable plan for improvement consists of a channel with bottom width of 300 feet (280 feet in the divide cut) and that the project is economically justified when all tangible, intangible, and secondary benefits are taken into consideration." It is interesting to note that intangible and secondary benefits are included in the conclusion of the District Engineer. These were set forth in the report to include the effects of stimulation of growth in the Appalachian region. Specific reference is made to the savings in transportation costs to shippers distributed over a wide area in eastern and southwestern regions. "Over 62 percent of the traffic yielding approximately 59 percent of the savings would originate or terminate in Appalachia, and the cheaper transportation service could very likely stimulate industrial expansion or further exploitation of natural resources in that area It is expected that when a satisfactory method of deriving both secondary and Appalachian benefits is developed, the benefit-to-cost ratio for the Tennessee-Tombigbee would be much higher than estimated in this report."^{5/}

^{5/} Mobile District, U.S. Army Corps of Engineers, Tennessee-Tombigbee Waterway, Alabama and Mississippi, Supplement to General Design Memorandum, Reevaluation of Project Economics, 1966, p. 13.

TABLE 9

**BENEFIT ESTIMATES FOR THE TENNESSEE-TOMBIGBEE WATER
PROJECT (AVERAGE ANNUAL EQUIVALENT BENEFITS)**

<u>Benefit Type</u>	Project with 50-Year Life	
	<u>200 Foot Project</u>	<u>300 Foot Project</u>
Navigation	\$ 11,949,000	\$ 15,817,000
Recreation	2,894,000	2,894,000
Fish and Wildlife	135,000	135,000
Area Development	<u>1,946,000</u>	<u>2,146,000</u>
Total	\$ 16,924,000	20,992,000

	Project with 100-Year Life	
	<u>200 Foot Project</u>	<u>300 Foot Project</u>
Navigation	\$ 14,048,000	\$ 18,500,000
Recreation	3,480,000	3,480,000
Fish and Wildlife	135,000	135,000
Area Redevelopment	<u>1,608,000</u>	<u>1,743,000</u>
Total	\$ 19,271,000	\$ 23,858,000

<u>Item</u>	Project with 50-Year Life	
	<u>200 Foot Project</u>	<u>300 Foot Project</u>
Annual Benefits	\$ 16,924,000	\$ 20,992,000
Annual Costs	<u>\$ 15,419,000</u>	<u>\$ 16,967,000</u>
Ratio	1:1.1	1:24.1

	Project with 100-Year Life	
	<u>200 Foot Project</u>	<u>300 Foot Project</u>
Annual Benefits	\$ 19,271,000	\$ 23,858,000
Annual Costs	<u>\$ 13,135,000</u>	<u>\$ 14,445,000</u>
Ratio	1:5.1	1:7.1

Source: U.S. Army Corps of Engineers, Mobile District, Tennessee-Tombigbee Waterway, Alabama and Mississippi Supplement to Design Memorandum No. 1 - General Design Re-Evaluation of Project Economics, 1966.

The purpose of this study is not to reevaluate the feasibility of the Tennessee-Tombigbee Waterway Project; its feasibility and economic justification have been clearly shown by the Corps of Engineers in its report to the Congress. Recently, the Congress appropriated \$500,000 for fiscal year 1967 to complete pre-construction planning and to continue the detailed advance engineering and design work required for the Project.

The purpose of this report is to show the development potential of the Appalachian Area of Mississippi which clearly depends upon the early construction of the Waterway Project and other water resource projects.

Expansion Benefits. In summary, annual costs which may be linked to development of the Waterway are estimated to be \$16.9 million. The annual benefits allocated to the Waterway equal \$521.6 million, and clearly cannot be obtained unless the close relationship between industrial development, economic expansion, and the provision of water transportation is assured.

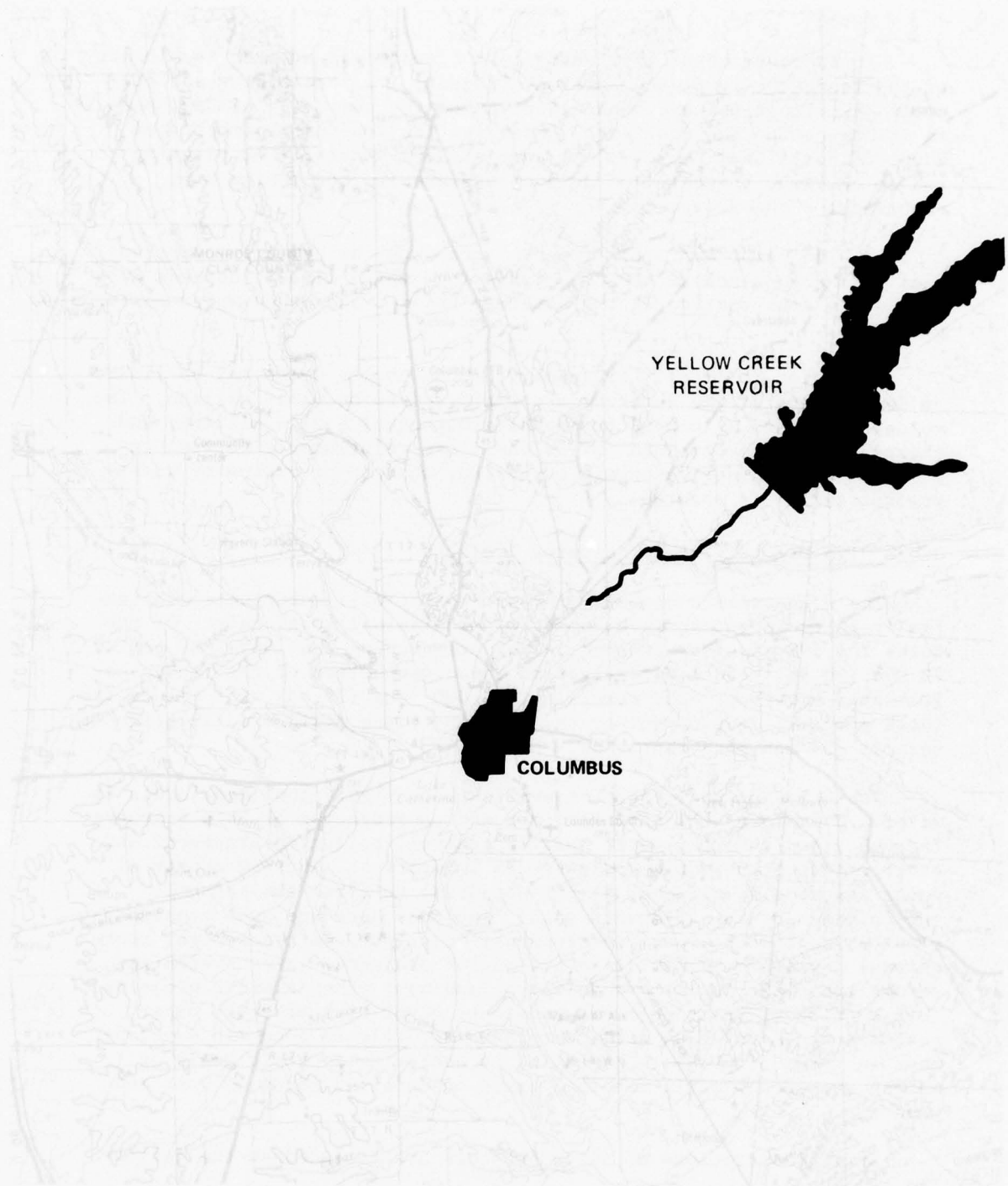
Other High Priority Water Resource Projects

The Tennessee-Tombigbee Waterway Project will contribute substantially to the economic development of Mississippi Appalachia. Of the total 136,000 new jobs created in the area during the 1965-2020 period, 28,000 (20.5%) result directly from the construction of the Tennessee-Tombigbee Waterway. The remaining 108,000 jobs (79.5%) will result from total economic development of the area including maximum utilization of natural and man-made resources.

The prime natural resource available to Mississippi Appalachia is water. Therefore, the efficient use and conservation of this resource through flood control, water quality control, pollution abatement and other resource protection measures is imperative. Another aspect of water resource development is its potential to serve the economic growth needs of the 20-county area. Included here are such considerations as navigation, port development, multi-purpose reservoirs, recreational developments, wildlife protection projects, water system and sewage treatment facility development and many other similar projects. This section of the supplement considers other high priority water resource projects which will contribute directly to economic development in terms of projects essential to achieving economic goals or which are economically feasible based on detailed study of cost and benefits.

Brief descriptions of these projects are included on the following pages.

FIGURE 12
YELLOW CREEK RESERVOIR



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PROJECT DESCRIPTION

Project Number: 01

Project Name: Yellow Creek Reservoir

County: Lowndes, Mississippi and Lowndes, Alabama

Type of Project: Feasibility Study

Project Identification Agency: County of Lowndes,
City of Columbus,
Mississippi Association of Soil Con-
servation District Commissioners

Location: This project consists of a proposed multi-purpose reservoir located on Yellow Creek above the City of Columbus, Mississippi. A specific location has not been selected.

Project Description: The expected low flow on Luxapalila Creek resulting in part from flood control work will seriously impair the present water supply of the City of Columbus. Yellow Creek, which contributes 42.5 percent of the flow reaching Columbus via Luxapalila Creek, will provide the solution to this anticipated problem. A multi-purpose reservoir is proposed on Yellow Creek above Columbus to provide low-flow augmentation for domestic and industrial water supply, recreation opportunities, and flood control. It is recommended that study of this project be greatly accelerated to facilitate development of the project at an early date.

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PROJECT DESCRIPTION

Project Number: 02

Project Name: Luxapalila Creek
Flood Control Project

County: Lowndes

Type of Project: Stream Cut-offs and Channel Enlargement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: The project begins south of Columbus at the confluence of Luxapalila Creek and the Tombigbee River and extends 19 miles to Steens, Mississippi.

Project Description: The upper reach of Luxapalila Creek from the mouth of Yellow Creek into Alabama was improved by the Corps of Engineers in 1942 at a cost of \$81,968. However, in the 26 years that have since elapsed, many reversions of the Creek to its former condition have taken place.

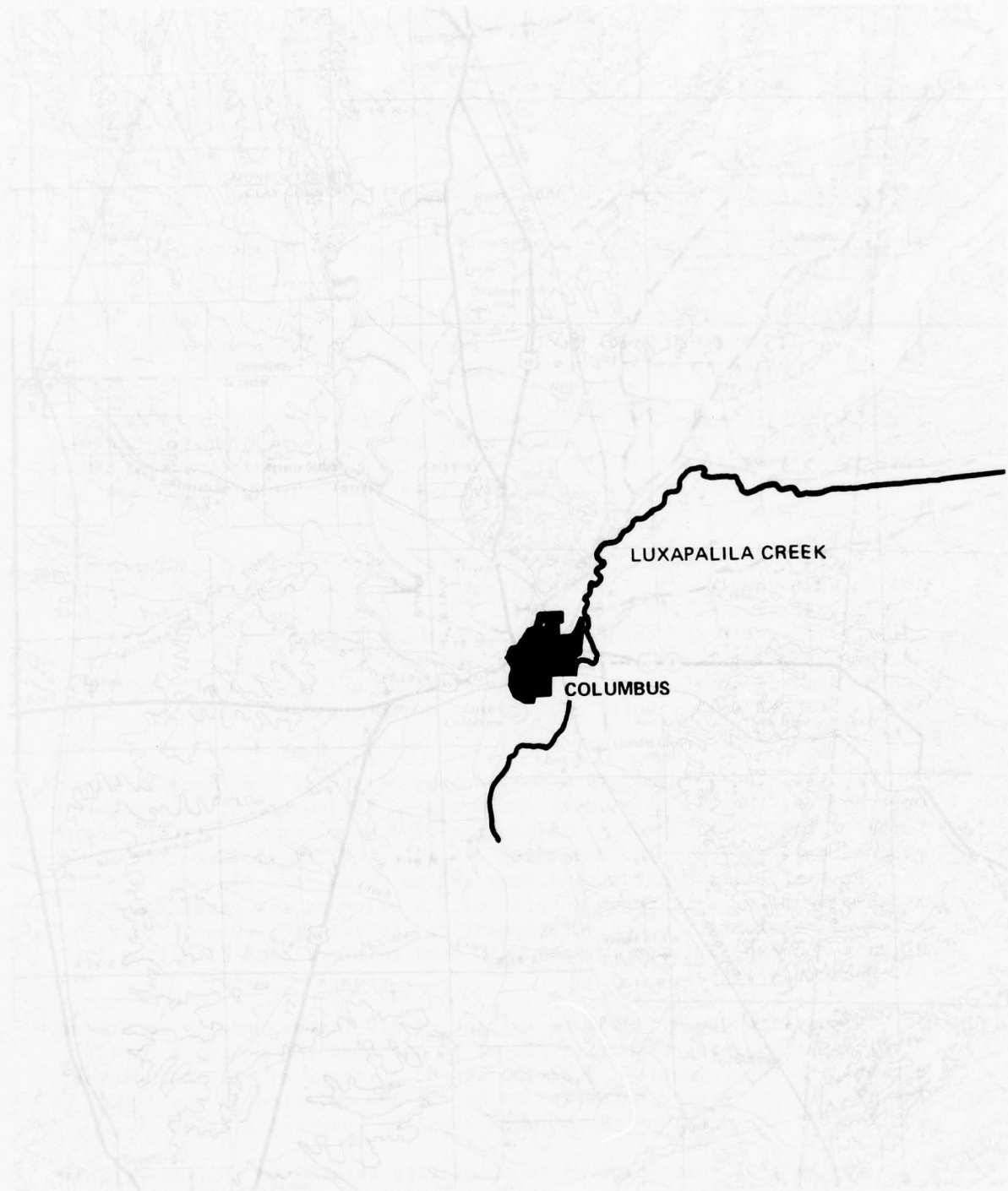
Flood control works, recently authorized for Luxapalila Creek by the Corps of Engineers, include slightly more than 19 miles of cut-offs, channel enlargement and new channel. In the vicinity of Columbus 5.6 miles of cut-offs and channel enlargement are recommended. The enlarged channel through this section, with a 60 foot width and 18 foot depth, will improve channel capacity to 8,800 c.f.s. Channel openings at six bridges will require enlargement to adequately handle the increased flow.

In the middle reach, from the highway bridge at the Columbus Waterworks to one-quarter mile below the mouth of Yellow Creek, recommended Corps of Engineers improvements consist of 6.06 miles of cut-offs and channel enlargement. The remaining 7.5 miles of the flood control project on Luxapalila Creek extend from Yellow Creek into Alabama. Improvements along this reach consist of 3.4 miles of new canal and 4.1 miles of re-excavation and enlargement of the existing canal. Four highway and two railroad bridges will need reinforcement of piling in new channel sections.

Luxapalila Creek floods an average of 2.8 times annually at Steens, Mississippi, causing extensive damage to cropland and posing a threat not only to the community of Steens but to portions of eastern Columbus. The problem is further magnified by debris accumulation in the lower portions of the previously excavated canal on Luxapalila Creek.

The initial cost involved in completing this flood control project is 1.4 million dollars. Annual benefits of \$165,500 far exceed the

FIGURE 13
LUXAPALILA CREEK FLOOD CONTROL PROJECT



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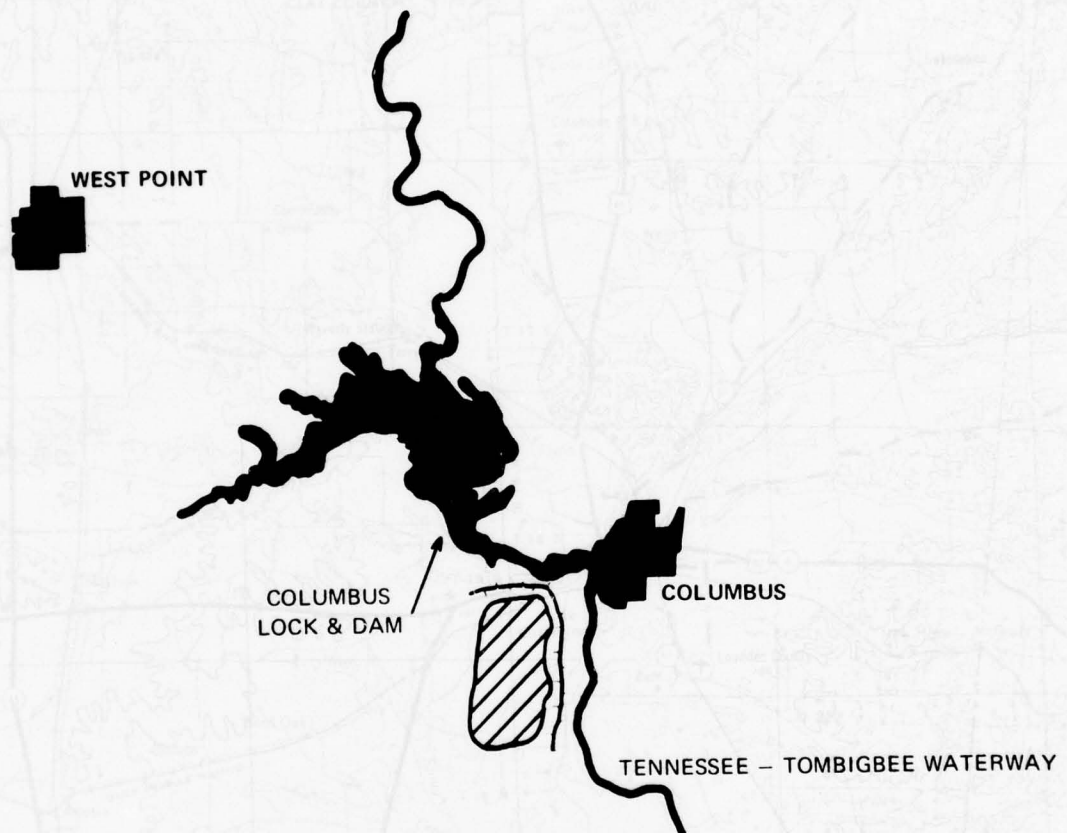


Mississippi Research and Development Center

annual cost of \$59,800. The Luxapalila Creek Flood Control Project has one of the highest established **benefit-to-cost** ratios of Mississippi Appalachia Water Resource Projects. The Soil Conservation Service is also becoming involved in flood control work on Luxapalila Creek and its tributaries through PL 566 assistance.

Completion of the project would eliminate the hazard of major floods to urbanized areas east of Columbus as well as to other reaches of Luxapalila Creek.

FIGURE 14
TOMBIGBEE RIVER LEVEE
"GOLDEN TRIANGLE" AREA



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PROJECT DESCRIPTION

Project Number: 03

Project Name: Tombigbee River Levee
"Golden Triangle" Area

County: Lowndes

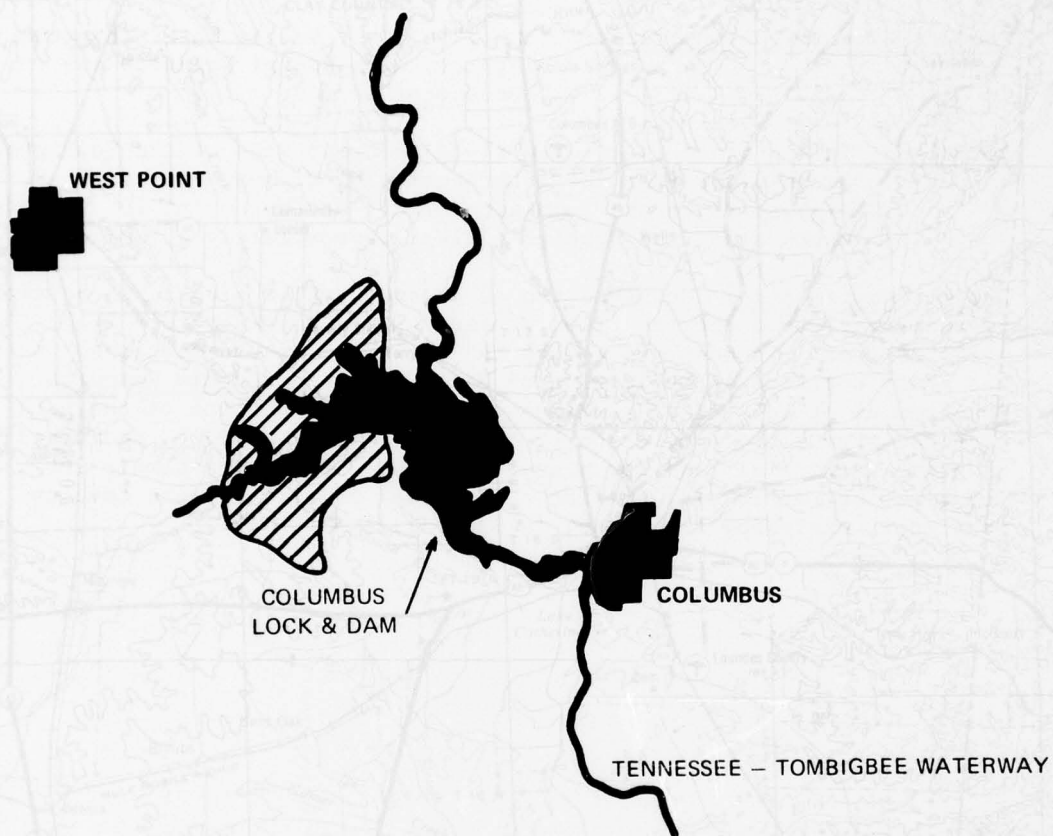
Type of Project: Flood Control, Port Development

Project Identification Agency: Tombigbee River Valley Water Management
District, Mississippi Research and
Development Center.

Location: This project is a levee along the west side of the Tombigbee
at Columbus from the intersection of Highway 45E and U. S.
Highway 82 to the Tombigbee River; at that point it proceeds
south along the Tombigbee River approximately 4.5 miles.

Project Description: Construction of a levee system along this portion
of the river would provide flood protection for approximately 2,184
acres of land. In accordance with the Regional Plan as developed in
the study entitled An Evaluation of Water-related Economic Resource
Development of Appalachia-in-Mississippi, a large portion of the area
provided with flood protection by the levee system would be developed
as prime industrial land for heavy industry. The cost estimate for
levee protection is \$1.1 million. The total industrial site develop-
ment cost, excluding the levee, is \$2.3 million by 1980.

FIGURE 15
"GOLDEN TRIANGLE" AREA PORT TERMINAL



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PROJECT DESCRIPTION

Project Number: 04

Project Name: "Golden Triangle"
Area Port Terminal

County: Lowndes

Type of Project: Development of Port Terminal

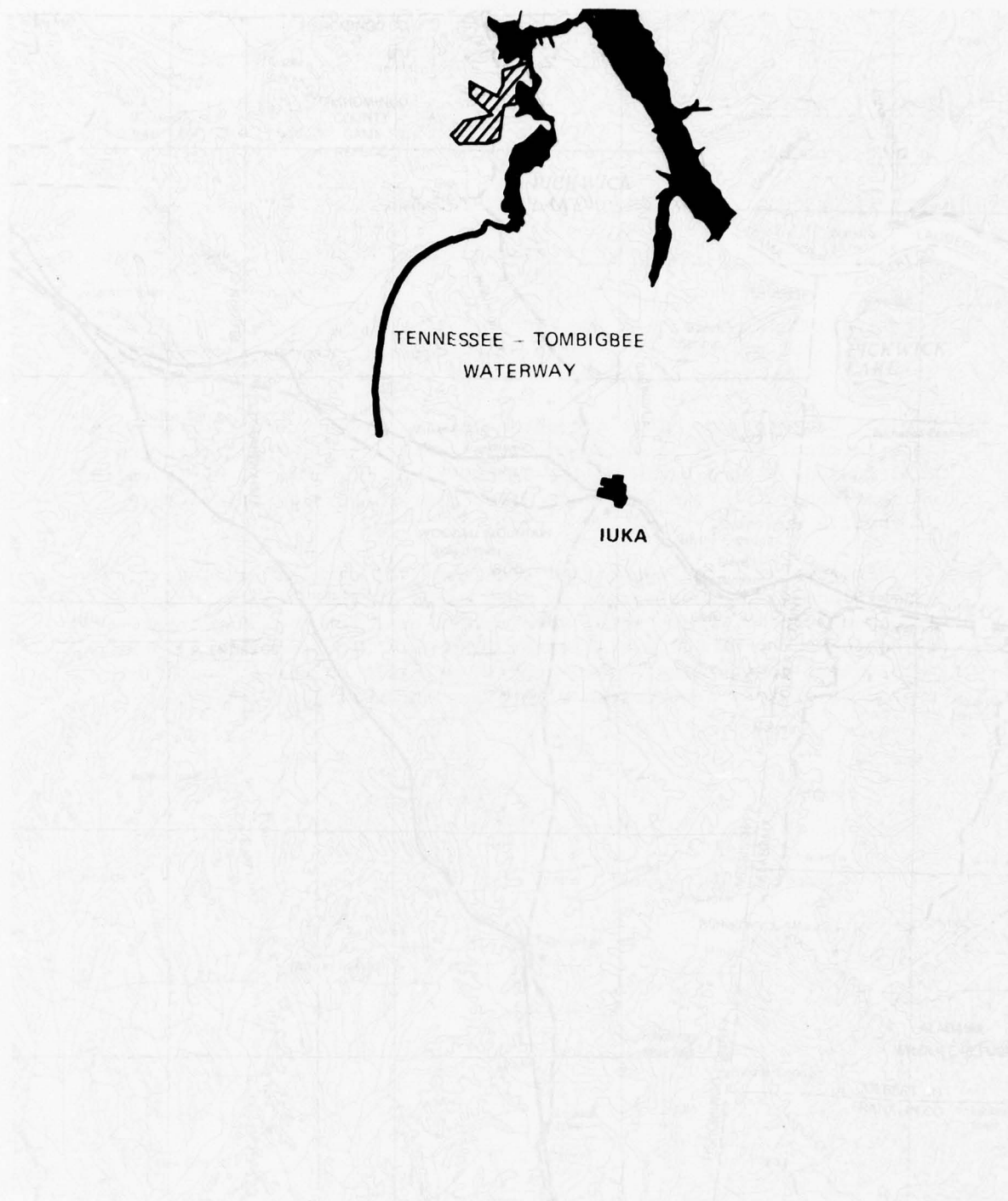
Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located approximately four miles northwest of the City of Columbus and adjacent to proposed Tennessee-Tombigbee Waterway.

Project Description: This project consists of development of a large port terminal in the southern portion of Mississippi Appalachia and will include a turn basin on the Tibbee River two miles from its point of confluence with the Tombigbee River near the Cities of Columbus, Starkville and West Point.

Industrial sites identified near the port terminal include 1,600 acres planned for development by 2020 based on the "Golden Triangle" Area Development Plan. Total development cost for the industrial site is estimated to be \$32.4 million by 2020 with \$16.8 million in port development cost. Also, flood control projects on the Tibbee River should be closely coordinated with plans for port development.

FIGURE 16
YELLOW CREEK PORT TERMINAL



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PROJECT DESCRIPTION

Project Number: 05

Project Name: Yellow Creek Port
Terminal

County: Tishomingo

Type of Project: Port Development

Project Identification Agency: Tennessee Valley Authority
Tombigbee River Valley Water Management
District

Location: This project is located in extreme northeastern Tishomingo County, in the southwest corner of section 22, approximately three miles from the mouth of Yellow Creek.

Project Description: A public port facility on Yellow Creek would provide an opportunity for existing industry to utilize the Tennessee River System. Development of the 760-acre port terminal in itself would have only limited value to Mississippi Appalachia. It is the industrial plant investment likely to occur after port development which will be of greatest value to the area. Previous studies of private investment in Tennessee River waterfront plants and terminals indicate a substantial investment in industry since 1945 when the navigable channel was completed.

Northeast Mississippi has access to the inland waterway system at only one point, Lake Pickwick Reservoir. This untapped potential of Lake Pickwick for industrial development, as determined in a study prepared by the Mississippi Research and Development Center entitled An Evaluation of Water-related Economic Resource Development of Appalachia-in-Mississippi, indicates the effects of navigation and port development on future employment in the area.

Benefits accruing to the area from port development and access to navigation are several times the estimated cost of a port facility. The effects of navigation and port development on wages and investment are indicated on the accompanying table for a four-county area adjacent to the Yellow Creek site. The total estimated cost for development of the port terminal is \$7.0 million. Included in the cost estimate is construction of 12 miles of railroad to the port, dock facilities and warehouses, purchase of the industrial land, access roads, equipment, and channel improvements. Approximately \$5.4 million of federal funds will be supplemented by \$1.6 million of state and \$65,000 of local funds in construction of the above facilities. Total benefits in shipping savings, wages, and land enhancement amount to over \$44.5 million.

The Bureau of Business and Economic Research, Mississippi State University, in a 1967 feasibility study determined that direct benefits

resulting from usage of the Yellow Creek port by existing firms in the area will total \$104,625 in average annual revenues. The estimated revenue to the port from the attraction of one new industry would be approximately \$6,975 per year.

Table 10 estimates the likely impact of the port facility on the four-county Regional Economic Area based on studies done in An Evaluation of Water-related Economic Resource Development of Appalachia-in-Mississippi. The Tennessee Valley Authority has also prepared an independent study of the port and found it to be a feasible project.

TABLE 10

REGIONAL ECONOMIC AREA IV
(Alcorn, Tippah, Tishomingo, Prentiss Counties)

Effects of Navigation and Port Development on Wages & Investment

1980 (\$000) 2000 (\$000) 2020 (\$000)

WAGES

	<u>With</u>	<u>Without</u>	<u>With</u>	<u>Without</u>	<u>With</u>	<u>Without</u>
Manufacturing	\$ 91,535	\$ 83,296	\$ 234,478	\$ 213,374	\$ 490,732	\$ 446,566
Nonmanufacturing	109,538	99,679	290,007	263,906	641,901	584,129
Public Administration	<u>9,612</u>	<u>8,746</u>	<u>35,913</u>	<u>32,680</u>	<u>90,859</u>	<u>82,681</u>
Total	\$210,685	\$191,721	\$ 560,398	\$ 509,960	\$1,233,492	\$1,113,376

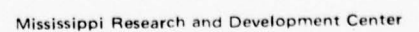
INDUCED INVESTMENT

	<u>With</u>	<u>Without</u>	<u>With</u>	<u>Without</u>	<u>With</u>	<u>Without</u>
Private	\$400,842	\$364,766	\$1,554,378	\$1,414,483	\$3,609,172	\$3,284,346
Public	<u>117,556</u>	<u>106,975</u>	<u>237,653</u>	<u>216,264</u>	<u>306,698</u>	<u>279,095</u>
Total	\$518,398	\$471,741	\$1,792,031	\$1,630,747	\$3,915,870	\$3,563,441

DIFFERENCE

	<u>1980</u>	<u>2000</u>	<u>2020</u>
Wages	\$ 18,964	\$ 50,438	\$ 120,116
Investment	<u>46,657</u>	<u>161,284</u>	<u>352,429</u>
	\$ 65,621	\$211,722	\$ 472,545

Topographic map of the Tennessee-Tombigbee Waterway area. The map shows the waterway route in black, starting near Fulton and extending southwards. The map includes labels for Lee County, Fulton, and the Tennessee-Tombigbee Waterway.



PROJECT DESCRIPTION

Project Number: 06

Project Name: Fulton Port Terminal

County: Itawamba

Type of Project: Port Development

Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located adjacent to Fulton, Mississippi,
and the Tennessee-Tombigbee Waterway.

Project Description: A public port on the Tennessee-Tombigbee Waterway is proposed at Fulton, Mississippi. This port will serve the central portion of Mississippi Appalachia and will provide access to water transportation from the industrial complex at Tupelo. Based on the Area Development Plan for the Pontotoc-Tupelo-Fulton Regional Economic Development Area, shown in An Evaluation of Water-related Economic Resource Development of Appalachia-in-Mississippi, Fulton has two potential industrial sites capable of supporting a port terminal. Combined, the two sites contain 196 acres, 75 of which will be developed by 1980. The total development cost for the port facility is \$3.2 million.

FIGURE 18

MONROE COUNTY PORT TERMINAL AND INDUSTRIAL AREA



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Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 07

Project Name: Monroe County Port
Terminal and Industrial Area

County: Monroe

Type of Project: Port Development

Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located midway between Amory and Aberdeen
on the Waterway, adjacent to the Monroe County Airport.

Project Description: The location of a county airport near the proposed Tennessee-Tombigbee in Monroe County provides the opportunity for port development near two other major means of transportation (i.e., the airport and U.S. Highway 45).

Based on the Area Development Plan for Monroe County, shown in An Evaluation of Water-related Economic Resource Development of Appalachia-in-Mississippi, the Waterway will have great influence upon the development of industrial land in the county since a major portion of the projected industrial development is expected to relate to the Waterway or to the potential to provide large quantities of water for water-related industries.

Industrial development costs are estimated to be \$7.5 million by 1980, \$19.6 million by the year 2000 and \$7.5 million by 2020. The total investment in industrial sites resulting from economic expansion is estimated at \$34.6 million by 2020 with one-third of this total in port development costs.

FIGURE 19
MONROE COUNTY REGIONAL RECREATION AREA



V-66-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 08

Project Name: Monroe County Regional
Recreation Area

County: Monroe

Type of Project: Recreation

Project Identification Agency: Mississippi Research and Development
Center

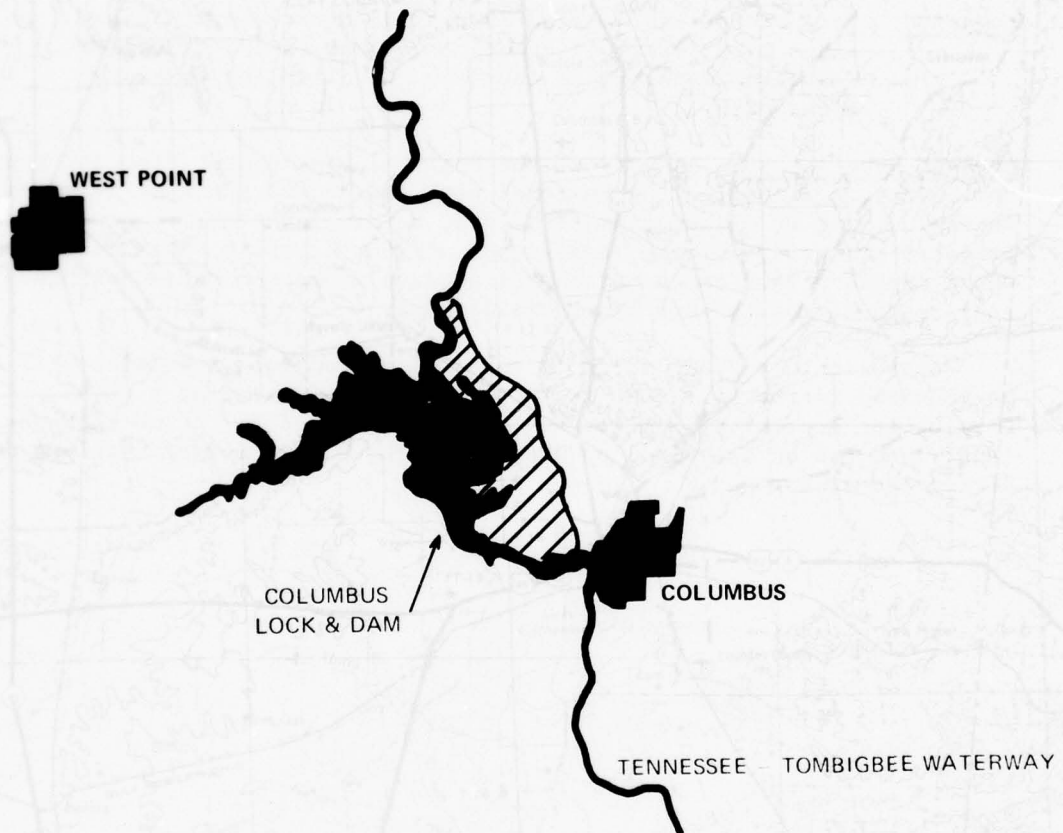
Location: This project is located in central Monroe County along both sides of a reservoir created by a dam on the Tennessee-Tombigbee Waterway at Aberdeen and extending to Amory, Mississippi.

Project Description: As part of the Regional Development Plan for Monroe County, a six-mile long regional park and recreation area is recommended. Lying on either side of a long, narrow reservoir to be constructed primarily for the Tennessee-Tombigbee Waterway, this facility would create a vast amount of shoreline development potential within easy reach of most of northeast Mississippi.

Approximately 2,300 acres of regional recreation facilities will be required by the year 2020 in the Amory-Aberdeen area at a total development cost of \$2.8 million. Much of the need for prime recreational land can be satisfied by developing the Monroe County Regional Recreation Area.

FIGURE 20

"GOLDEN TRIANGLE" REGIONAL RECREATION AREA



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Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 09

Project Name: "Golden Triangle"
Regional Recreation
Area

County: Lowndes

Type of Project: Recreation

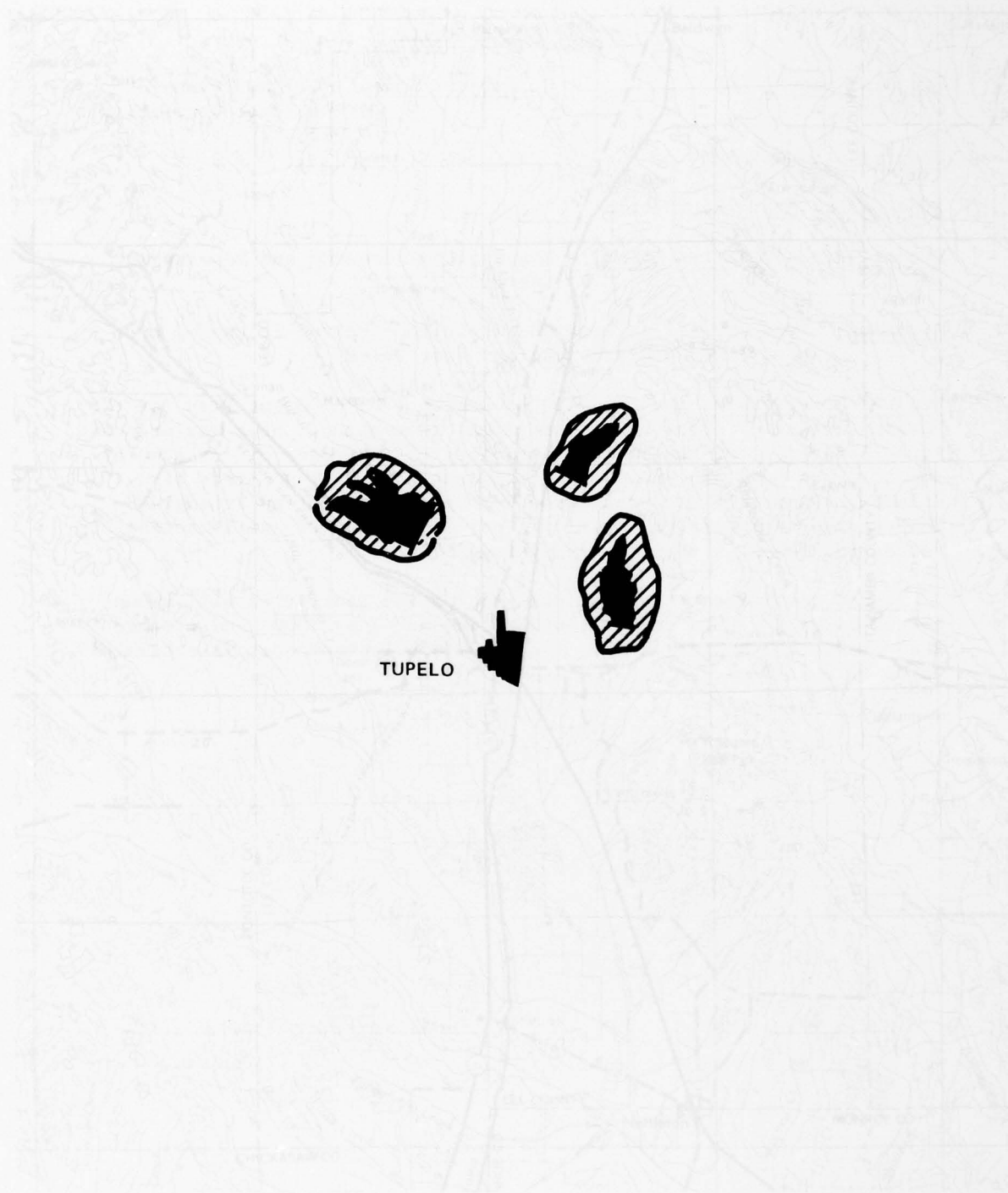
Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located within the "Golden Triangle" area
of Columbus, Starkville and West Point.

Project Description: As part of the Regional Development Plan for the
"Golden Triangle" area, a large regional recreational area was proposed
to be located along the eastern periphery of the reservoir created by
the Columbus Lock and Dam located adjacent to the city limits of
Columbus and within the urban growth area of the "Golden Triangle."
The recreational complex would be a primary source of easily accessible
recreation for this rapidly urbanizing area.

Land requirements for regional recreation facilities will amount
to 900 acres by 1980, an additional 2,400 acres by 2000, and another
2,440 acres by the year 2020. The total development cost is estimated
to be \$7.2 million.

FIGURE 21
MULTI-PURPOSE RESERVOIRS
TUPELO AREA



V-70-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 10

Project Name: Multi-purpose Reser-
voirs, City of Tupelo

County: Lee

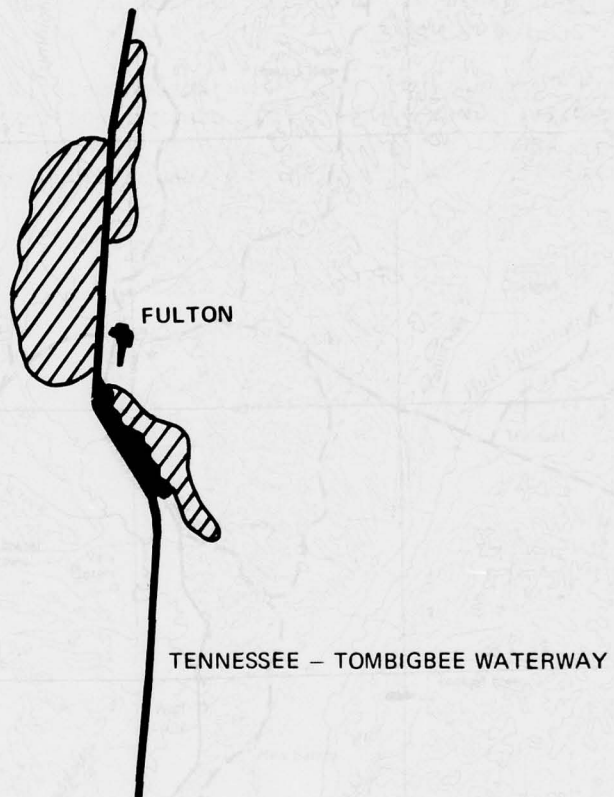
Type of Project: Recreation, Water Supply, Flood Control

Project Identification Agency: U.S. Department of Agriculture
Soil Conservation Service

Location: These projects are located north of the City of Tupelo,
Mississippi

Project Description: These projects consist of three multi-purpose
reservoirs, designed for flood control and recreational use by Tupelo
and Lee County residents. All three reservoirs, as proposed, would be
located within the Urban Growth Area of Tupelo.

FIGURE 22
FULTON REGIONAL RECREATION AREA



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Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 11

Project Name: Fulton Regional
Recreation Area

County: Itawamba

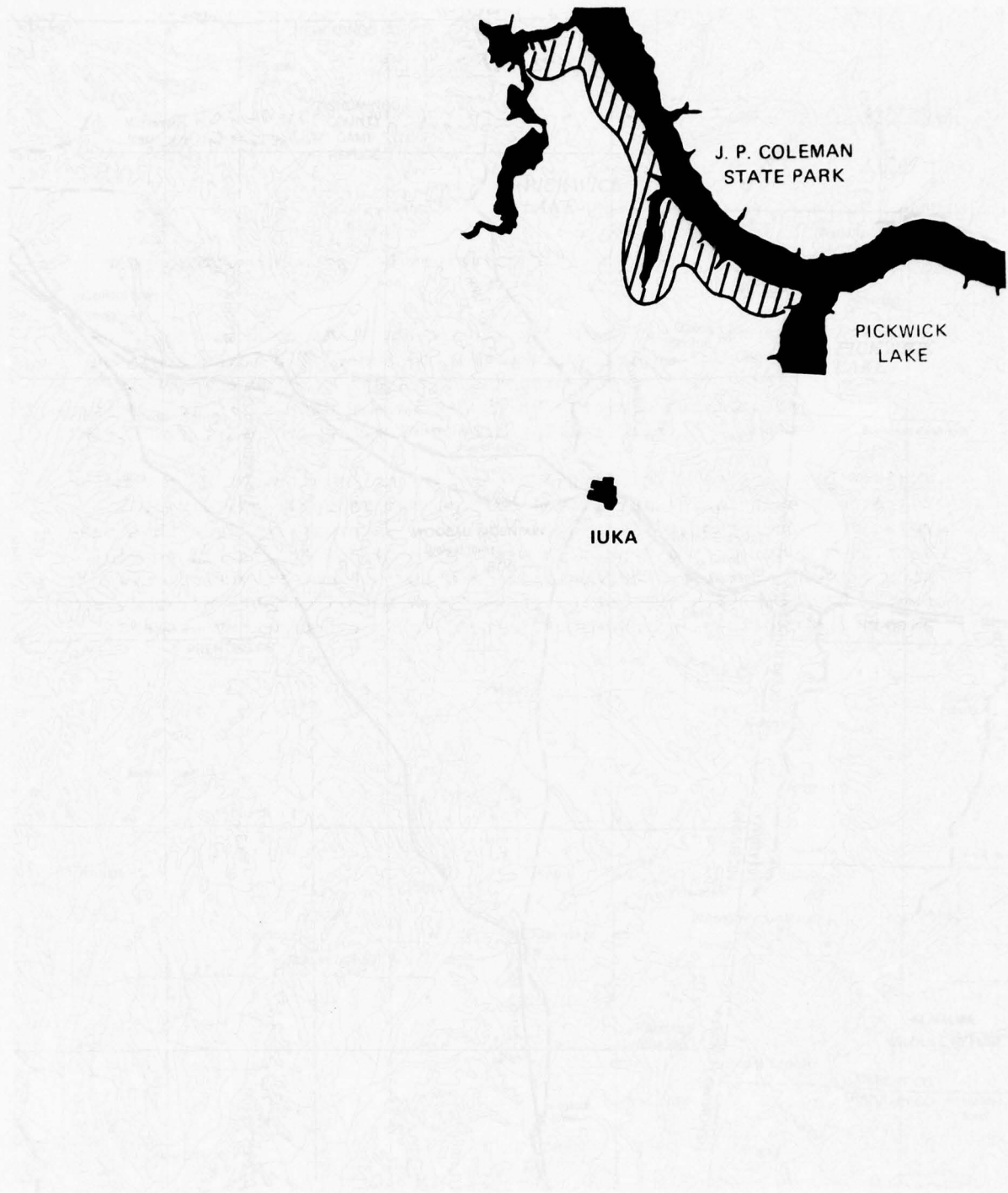
Type of Project: Recreation

Project Identification Agency: Mississippi Research and Development
Center

Location: Three separate park and recreation sites comprise the proposed Fulton Regional Recreation Area. Two large areas on either side of the proposed Tennessee-Tombigbee Waterway are located directly northwest of the City of Fulton, Mississippi. A third smaller site is located southeast of Fulton.

Project Description: This project consists of development of a complex of recreational facilities around Fulton, Mississippi, all directly related to the proposed Tennessee-Tombigbee Waterway and less than one-half hour's drive from Tupelo, a major Mississippi Appalachia population center. These recreation areas are now subject to periodic flooding. However, with completion of the Tennessee-Tombigbee Waterway and proposed prevention improvements, extensive development may proceed.

FIGURE 23
J. P. COLEMAN STATE PARK EXPANSION



0 5
Scale in Miles

V-74-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 12

Project Name: J. P. Coleman State
Park Expansion

County: Tishomingo

Type of Project: Recreation

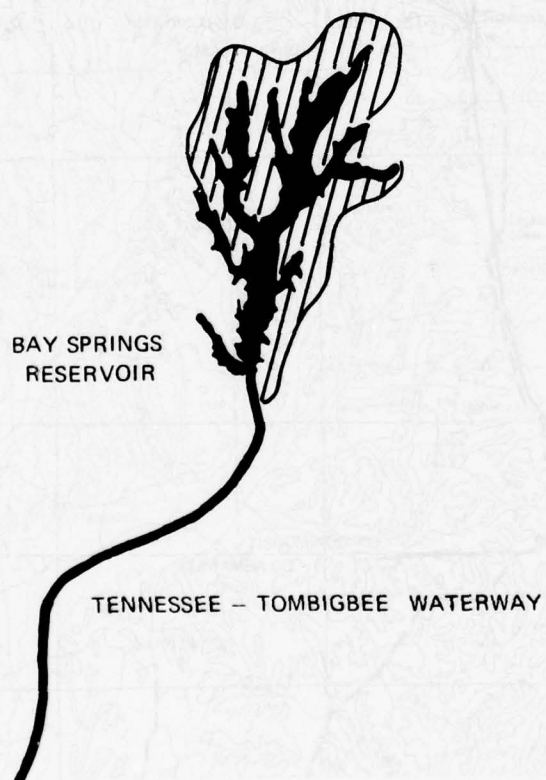
Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located adjacent to Pickwick Lake in extreme
northeast Tishomingo County.

Project Description: The project consists of enlargement of J. P.
Coleman State Park on the north and south in accordance with the
Regional Development Plan for the area as shown in An Evaluation of
the Water-related Economic Resource Development of Appalachia-in-
Mississippi. Overcrowded conditions in the present park facility are
an excellent indication of the need for additional park development.
Estimates of the recreational land requirements in the area by 1980
are 900 acres. An additional 2400 acres will be needed by the year 2000.

FIGURE 24

BAY SPRINGS REGIONAL RECREATION AREA



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Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 13

Project Name: Bay Springs Regional
Recreation Area

County: Prentiss, Tishomingo, Itawamba

Type of Project: Recreation

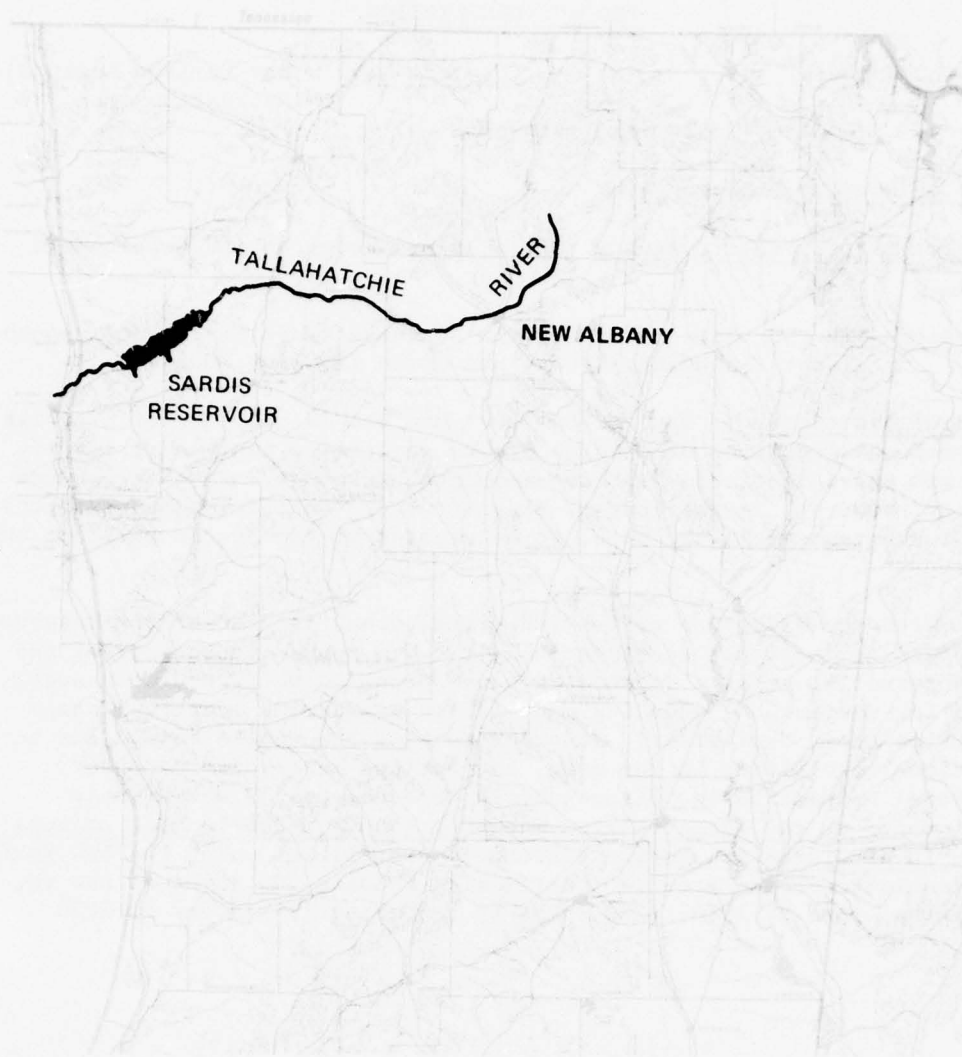
Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located in southeast Prentiss County, southwest Tishomingo County and north Itawamba County.

Project Description: Bay Springs Lock and Dam is only one of a series of proposed locks and dams which create reservoirs designed primarily to link portions of the Tennessee-Tombigbee Waterway. Bay Springs Reservoir, however, is the largest body of water, containing approximately 6,800 water acres in the pool, to be created by the system of locks and dams.

With the exception of two industrial areas located on the Reservoir, proposed recreational areas enclose it. The rugged topography of the area serves to greatly expand the water frontage which would be available for recreation, creating many narrow peninsulas ideal for campsites or other facilities. In order to meet the future demand for recreational facilities in the area, Bay Springs Reservoir and other regional recreation facilities should be developed as shown in An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi. Regional Economic Area IV, of which the Bay Springs Regional Recreation Area is a part, will require 500 acres of new recreational land by 1980, 1260 acres by 2000, and 1115 acres by 2020.

FIGURE 25
TALLAHATCHIE RIVER SCENIC BOATWAY



PROJECT DESCRIPTION

Project Number: 14

Project Name: Tallahatchie River
Scenic Boatway

County: Lafayette, Union, Tippah

Type of Project: Feasibility Study

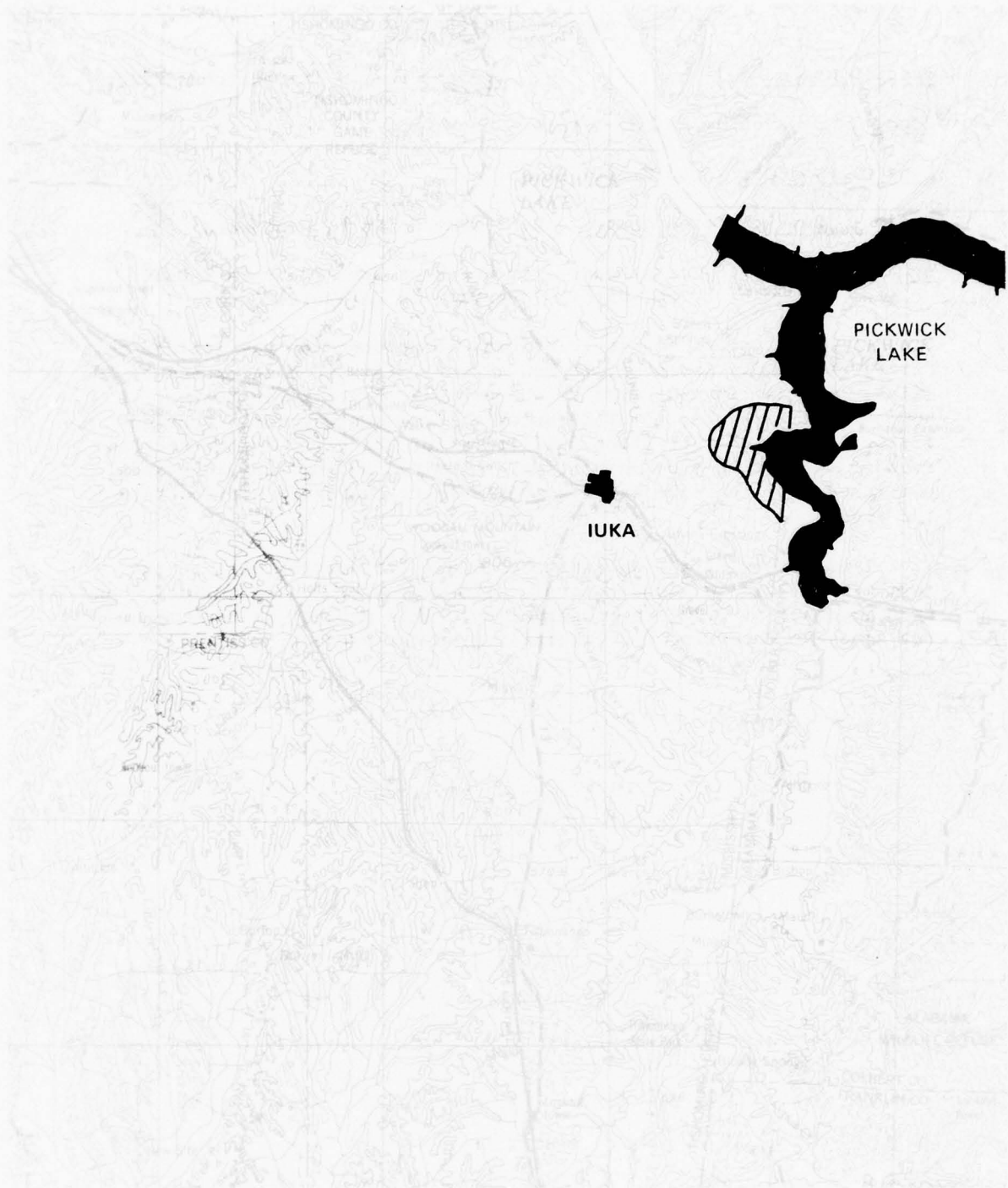
Project Identification Agency: U.S. Army Corps of Engineers

Location: The project extends from north of New Albany in Tippah
County to the Sardis Reservoir in Lafayette County.

Project Description: A scenic boatway is proposed on the Tallahatchie River from Sardis Reservoir to New Albany, a distance in excess of 50 miles. Similar in many ways to the proposed Pearl River Boatway in southern Mississippi, the Tallahatchie River Boatway would provide critically needed recreation facilities for the area. Water-related outdoor recreation such as boating, swimming, skiing, camping, and picnicking will then be readily available to residents and tourists in the area.

Improvement of the Tallahatchie River for boating will at the same time result in flood control, elimination of stream pollution and encouragement of wildlife conservation. This project is recommended for study to determine the feasibility of the project.

FIGURE 26
IUKA RECREATION AREA



V-80-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 15

Project Name: Iuka Recreational
Area

County: Tishomingo

Type of Project: Recreation

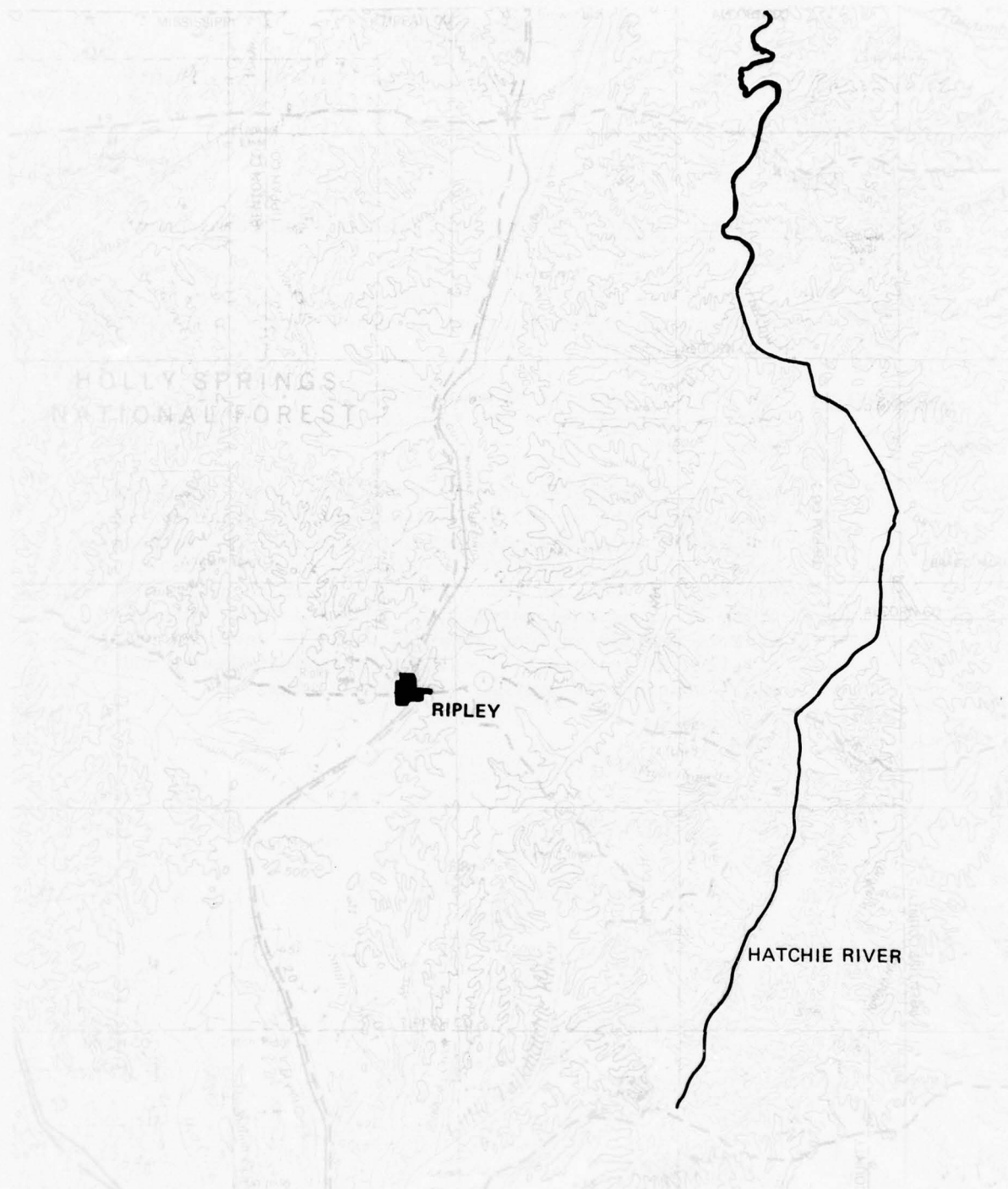
Project Identification Agency: Mississippi Research and Development
Center

Location: This project is located three miles east of the City of Iuka,
Mississippi, on the Mississippi-Tennessee State Line at Lake
Pickwick Reservoir.

Explanation: The project consists of an area designed for water-
related recreation on the Bear Creek inlet of Pickwick
Lake.

With the anticipated growth of the Iuka area, resulting from completion of the Tennessee-Tombigbee Waterway and subsequent industrial development, a nearby recreational area is a vital supplement to total area development. Unlike J. P. Coleman State Park and other recreation areas of a regional nature, the proposed Iuka Recreation Area is smaller in land area and would be designed principally for residents of eastern Tishomingo County and small portions of extreme northwest Alabama.

FIGURE 27
HATCHIE RIVER PROJECT



V-82-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 16

Project Name: Hatchie River Project

County: Alcorn, Tippah

Type of Project: Flood Control, Drainage, Water Quality Control, Water Pollution Abatement, Water Supply, Recreation and Channel Improvement

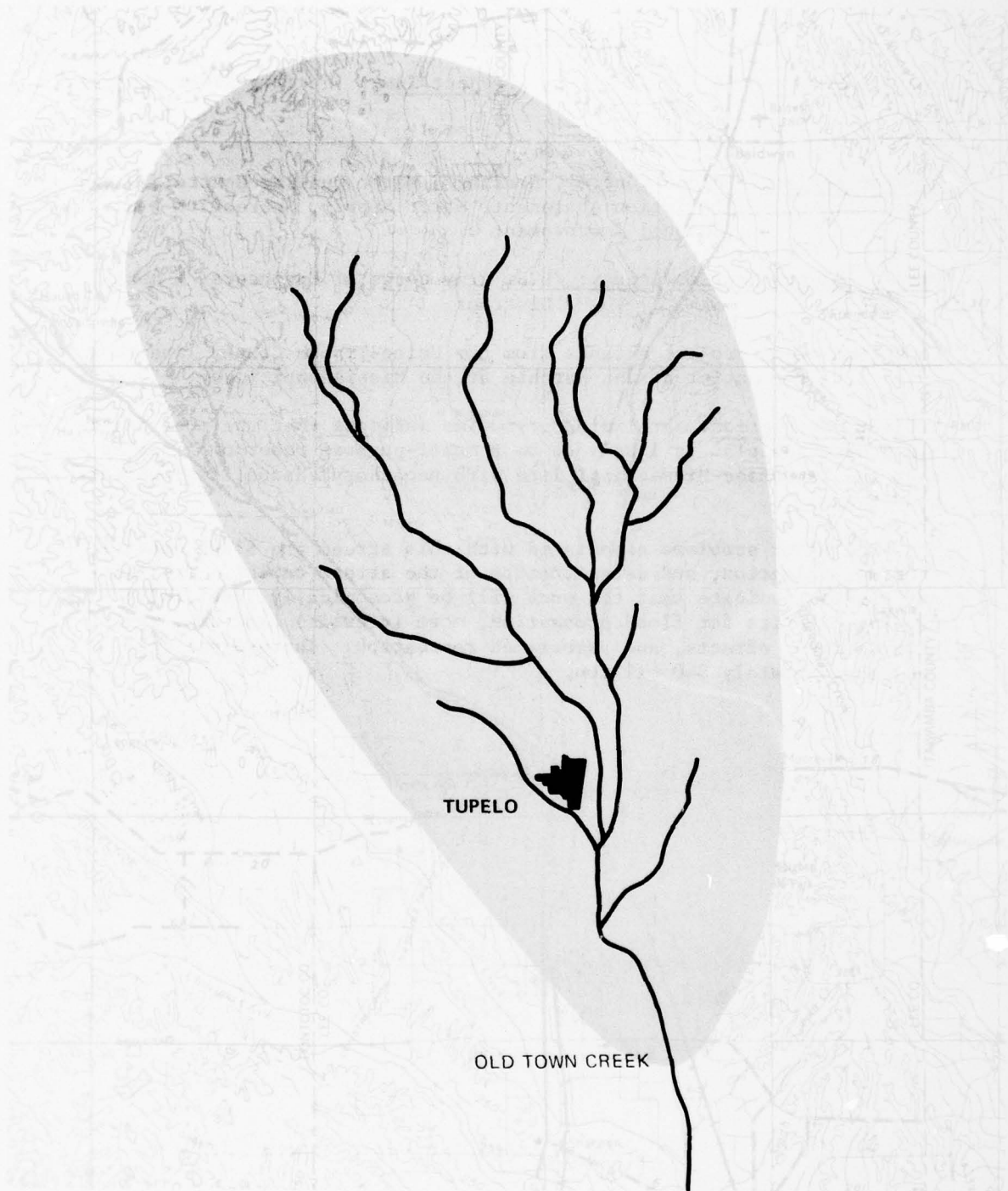
Project Identification Agency: U.S. Army Corps of Engineers, Memphis District

Location: This project extends from the Union-Tippah County line to the outlet of the Hatchie at the Mississippi River.

Project Description: Preliminary studies indicate that the most feasible protection plan is likely to be a multi-purpose reservoir located near the Tennessee-Mississippi line with necessary channel improvements downstream.

The major problems associated with this stream are flood control, erosion, siltation, and deterioration of the stream outlet. Preliminary studies indicate that the work will be economically justified including benefits for flood protection, more intensive land use, area redevelopment effects, and associated recreation. The project will cost approximately \$40 million.

FIGURE 28
TOWN CREEK PROJECT



PROJECT DESCRIPTION

Project Number: 17

Project Name: Town Creek Project

County: Union, Pontotoc, Lee, Prentiss

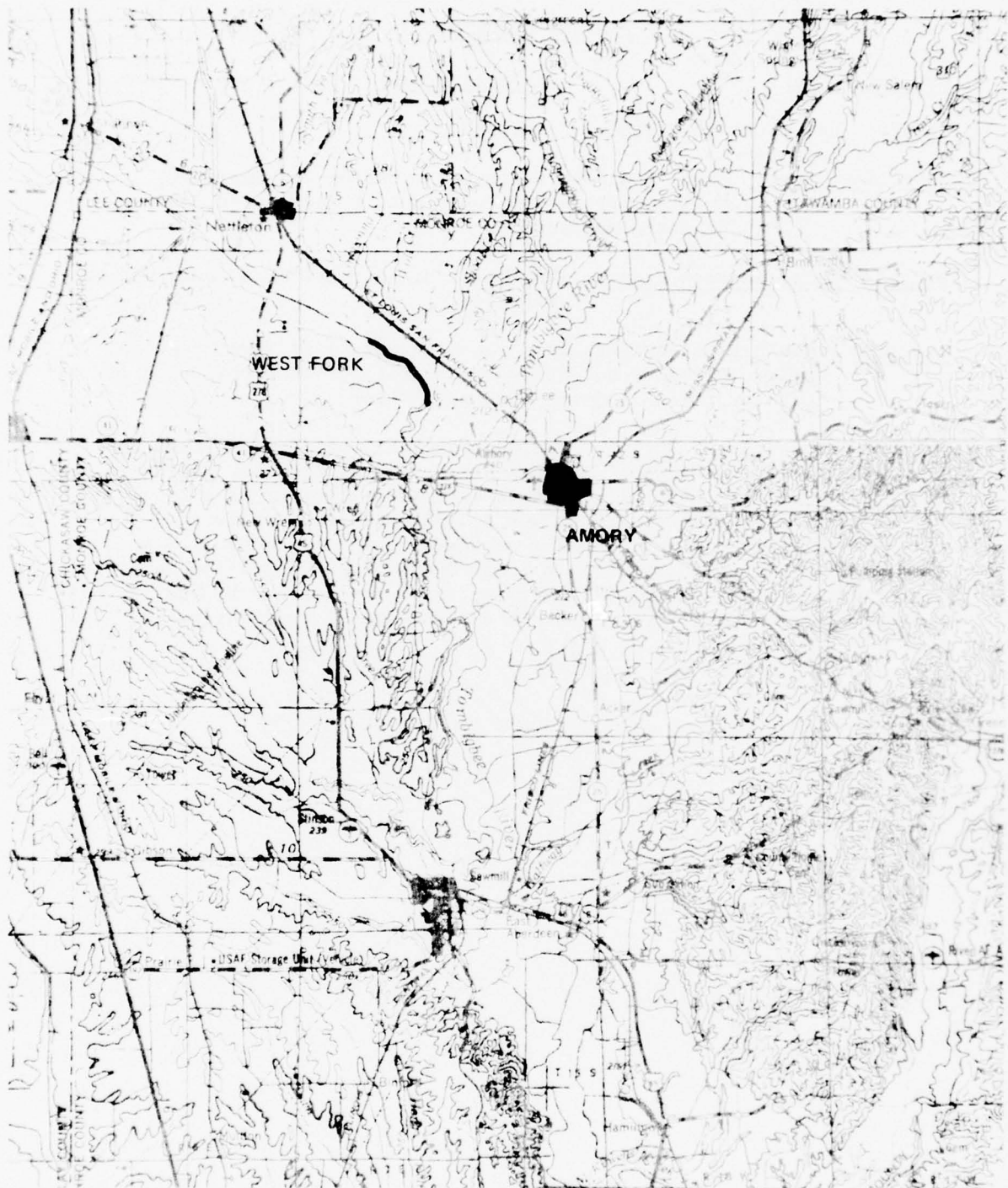
Type of Project: Flood Control, Drainage, Clearing and Snagging,
Multi-purpose Reservoir, Soil Conservation, and
Channel Improvement

Project Identification Agency: Northeast Mississippi Soil Conservation
District

Location: The project extends from the head-waters of Town Creek in
Union, Prentiss and Pontotoc Counties to the confluence of
Old Town Creek and the Tombigbee River.

Project Description: Erosion, sediment damage, and flooding have been
constant problems along the Old Town Creek similar to other Tombigbee
River Tributaries. Economic benefits estimated to occur as a result
of the flood protections work amount to \$798,832 annually for a 2.5
to 1.0 **benefit-to-cost** ratio. The estimated cost of the project is
\$8.8 million with \$3.9 million in local funds and \$4.9 million federal
funds. An advance loan of \$1.3 million has been approved by the Farmers
Home Administration to begin work in one section of this watershed.

FIGURE 29
WEST FORK (TOMBIGBEE RIVER) FLOOD CONTROL PROJECT



0 5
Scale in Miles

V-86-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 18

Project Name: West Fork (Tombigbee
River) Flood Control
Project

County: Monroe

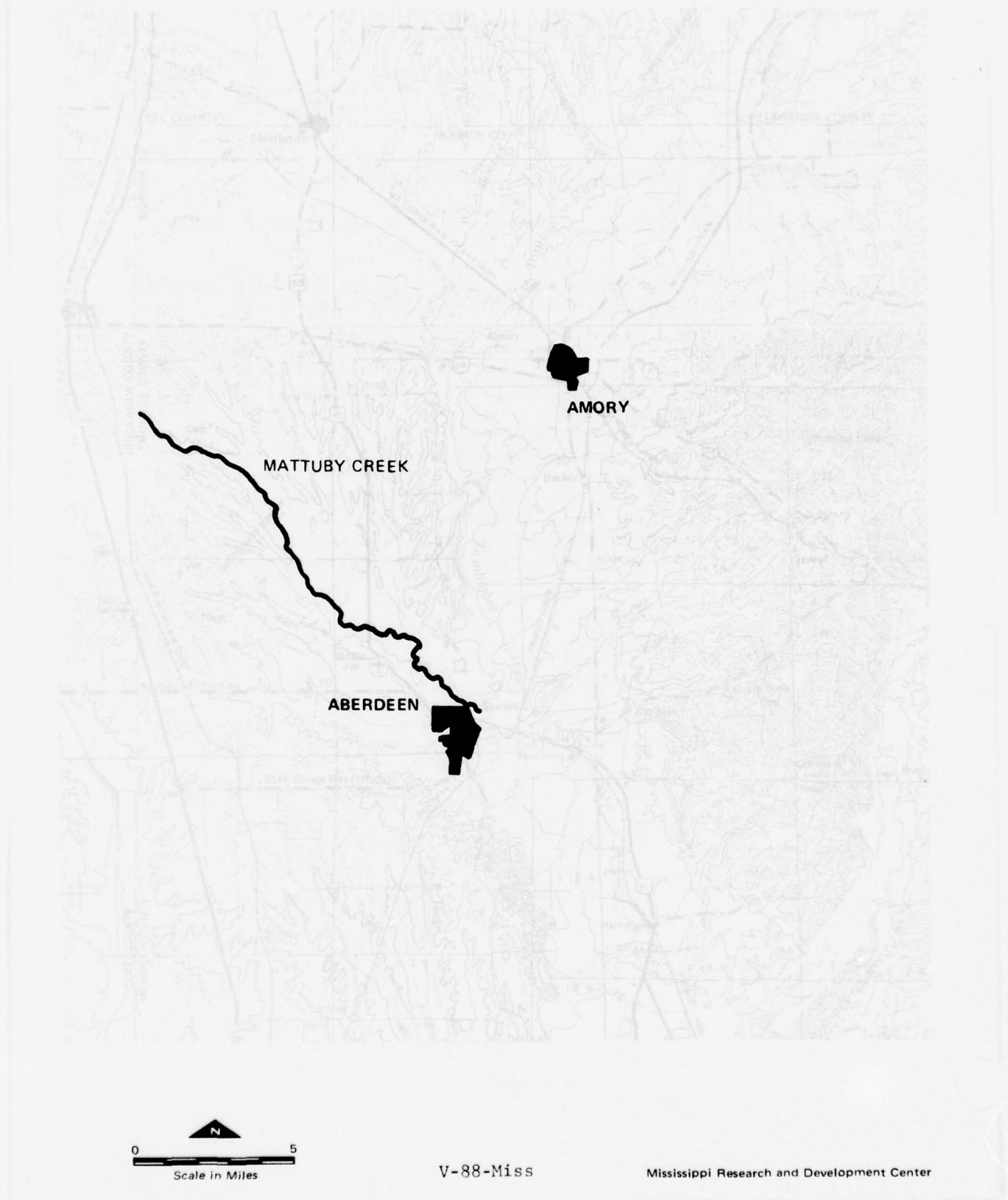
Type of Project: Flood control and channel improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: This project extends from river mile 1.4 above the junction
of the Tombigbee River upstream to river mile 3.1.

Project Description: The project consists of enlargement and realignment of the stream increasing its capacity to drain flood waters. This project results from flooding occurring an average of 8.0 times each year and affecting approximately 1,100 acres. The feasibility of this project is based on House Document No. 167, 84th Congress, 1st Session, dated 18 May 1955. The economic benefits expected to accrue to the project will be \$12,800 annually. However, the project has not been scheduled for construction. Funding for the project will consist of \$270,000 by the U.S. Army Corps of Engineers and \$20,000 by the Tombigbee River Valley Water Management District. This project will reduce overbank flooding and permit more intensive agricultural practices in the area.

FIGURE 30
MATTUBY CREEK FLOOD CONTROL PROJECT



Priority Water Resource Projects

Projects listed in this section of the supplement consist of those which will affect the economic development of the Mississippi Appalachian area but which are not vital to development of identified primary growth areas as shown in An Evaluation of the Water-related Economic Resource Development of Appalachia-in-Mississippi. Most projects included in this section are of a flood control or channel improvement type.

PROJECT DESCRIPTION

Project Number: 19

Project Name: Mattuby Creek Flood
Control Project

County: Lowndes

Type of Project: Flood Control, Drainage

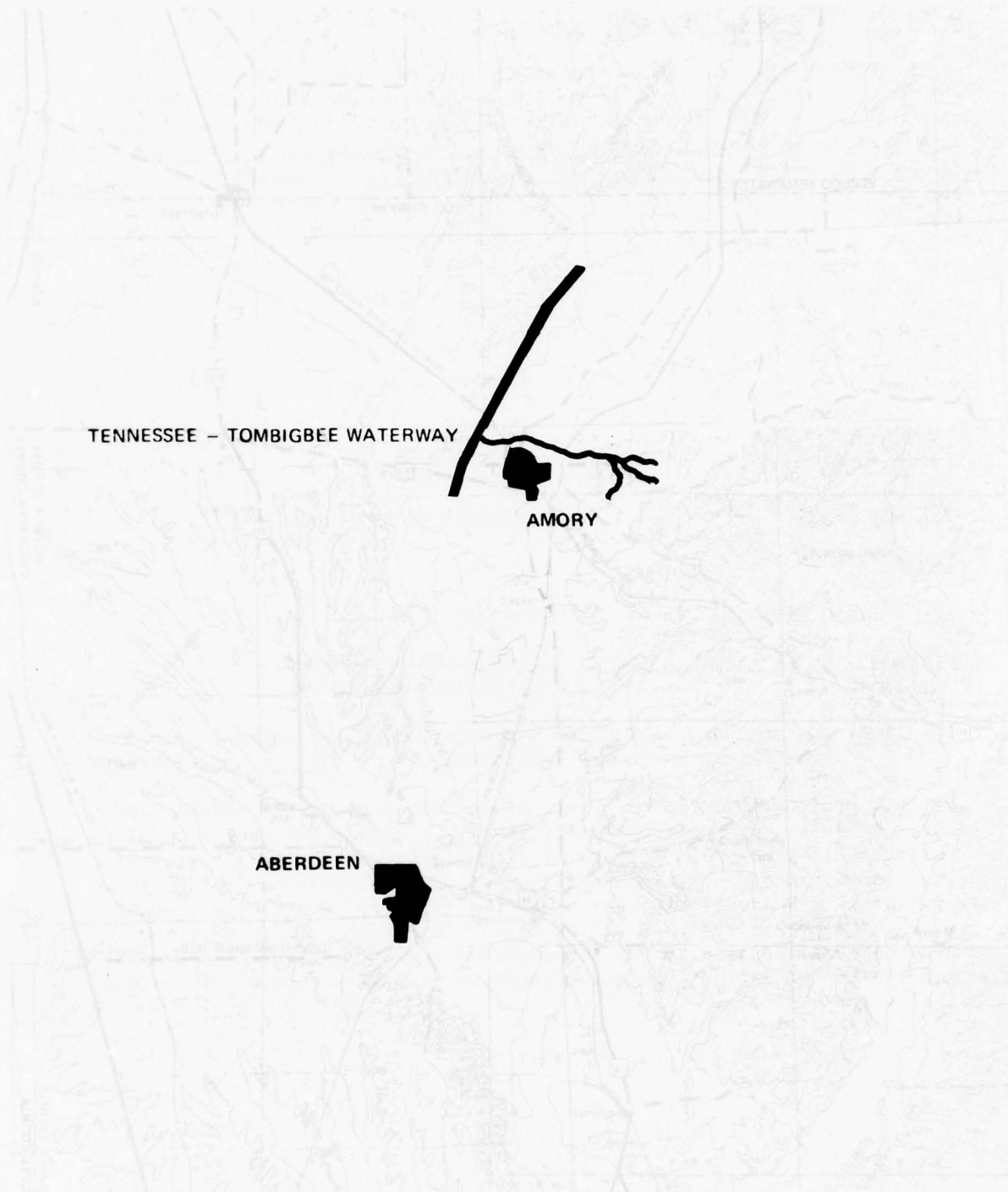
Project Identification Agency: U.S. Department of Agriculture
Soil Conservation Service

Location: The project is located along Mattuby Creek extending from the Chickasaw County line southeast to the City of Aberdeen.

Project Description: Improvements along this stream will affect land subject to flooding and primarily render it useful for agricultural purposes. The economic effects of flood control will include agricultural development, urbanization, recreation, and water supply. This project is given priority because of the location of the stream outlet within the urbanizing area of the City of Aberdeen. It is anticipated that persons residing in the Amory-Aberdeen Growth Area would take advantage of the recreational opportunities at small watershed flood control structures.

FIGURE 31

BURKETT CREEK AND ROUNDHOUSE BRANCH FLOOD CONTROL PROJECT



PROJECT DESCRIPTION

Project Number: 20

Project Name: Burkett Creek and
Roundhouse Branch
Flood Control Project

County: Monroe

Type of Project: Flood Control, Drainage

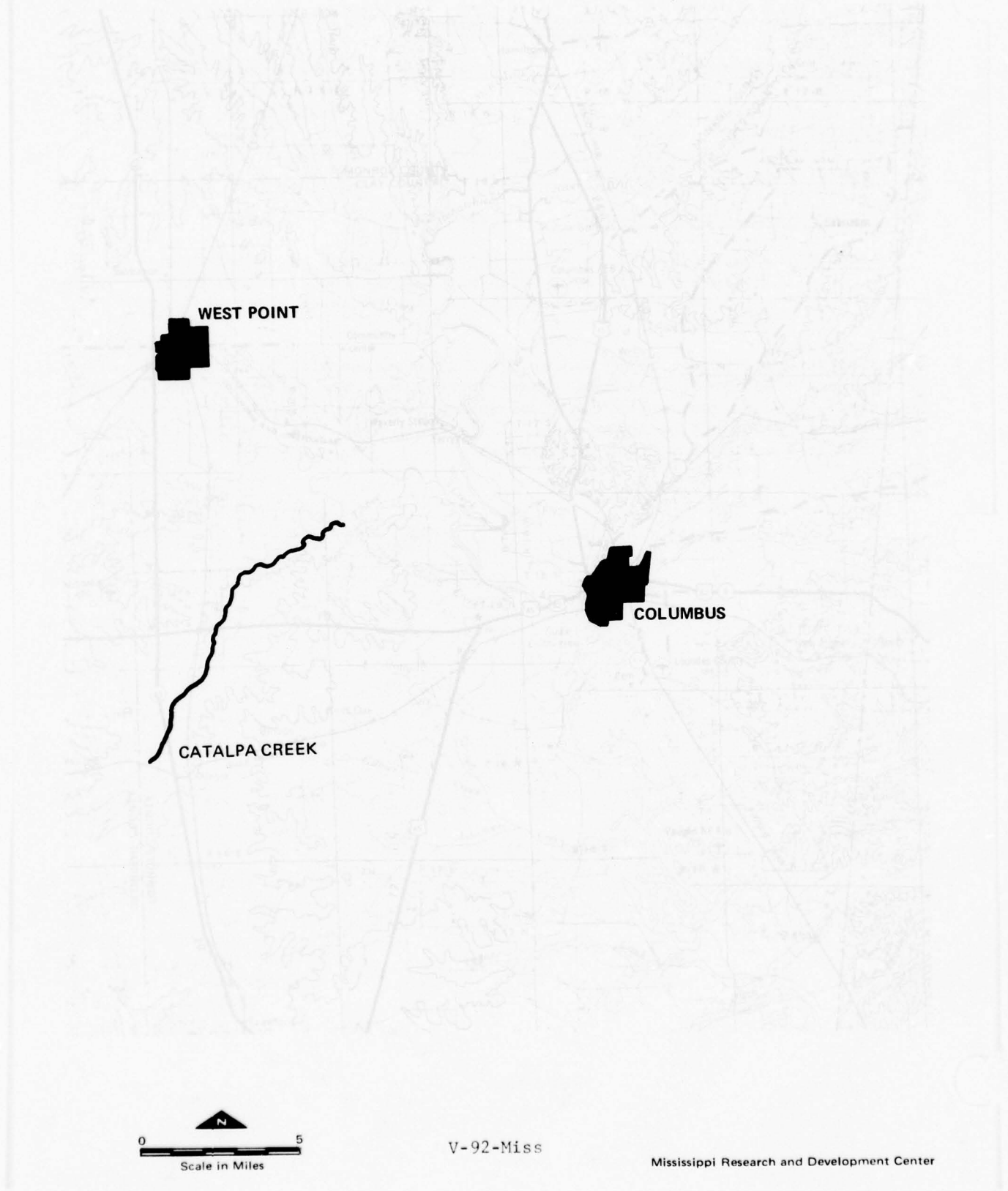
Project Identification Agency: City of Amory

Location: The project is located along Burkett Creek extending from Hatley, Mississippi, northwest through the center of the City of Amory, Mississippi, to the Tombigbee River west of the City.

Project Description: Improvement along this stream will protect land presently subject to flooding located within the City of Amory, Mississippi. The present extent of flood damage to urban areas is not known; however, a project of this nature is likely to free land presently subject to flooding for urban development.

FIGURE 32

CATALPA CREEK FLOOD CONTROL PROJECT



PROJECT DESCRIPTION

Project Number: 21

Project Name: Catalpa Creek Flood
Control Project

County: Lowndes

Type of Project: Clearing and Snagging, New Channel

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: The project extends along Catalpa Creek from its confluence with Tibbee Creek 11.0 river miles to south of Mayhew, Mississippi, near U. S. Highway 45 in Lowndes County.

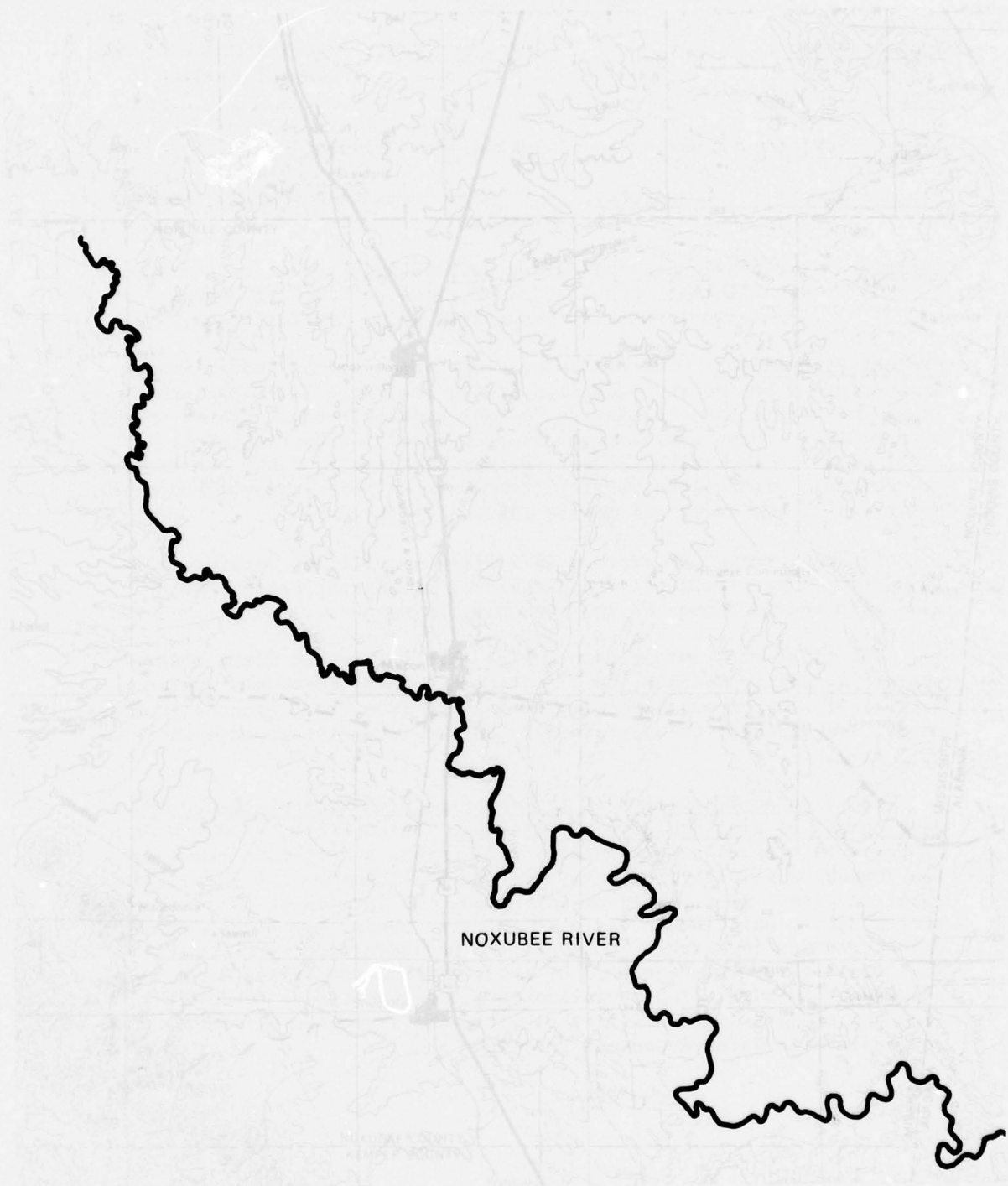
Project Description: Improvements, as proposed by the United States Army Corps of Engineers on Catalpa Creek, consist of clearing underbrush and debris and snagging of obstacles which tend to hinder smooth stream flow. These improvements are suggested for approximately 1.5 river miles in the extreme lower reaches of Catalpa Creek. An entirely new channel, with widths varying from 20 to 24 feet is recommended for 9.5 miles of the lower and middle reaches of the creek.

Flooding occurs an average of 9 times annually on Catalpa Creek inundating large sections of agricultural and forest land. Floods have also caused damage to the community of Mayhew.

The first cost involved in making this authorized flood control project a reality is \$365,000. Succeeding annual costs are approximately \$17,200. Annual benefits, resulting from flood control improvements, are expected to approach \$42,600 for a **benefit-to-cost** ratio of **2.53 to 1**.

Based on An Evaluation of the Water-related Economic Resources Development of Appalachia-in-Mississippi, Tibbee Creek, of which Catalpa Creek is a principal tributary, will become a port-turn basin on the Tennessee-Tombigbee Waterway for the development of a large industrial complex. As a result of this plan, the Catalpa Creek flood control project, which would begin at the turn basin, may require some major planning revisions. However, the economic effects of this project would be greatly enhanced by industrialization in the area. With or without immediate industrialization, the benefits to be derived from the project are sufficient to merit its serious consideration as an Appalachian Water Resources Project.

FIGURE 33
NOXUBEE RIVER FLOOD CONTROL PROJECT



V-94-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 22

Project Name: Noxubee River Flood
Control Project

County: Noxubee

Type of Project: Flood Control, Clearing and Snagging, Channel
Improvement

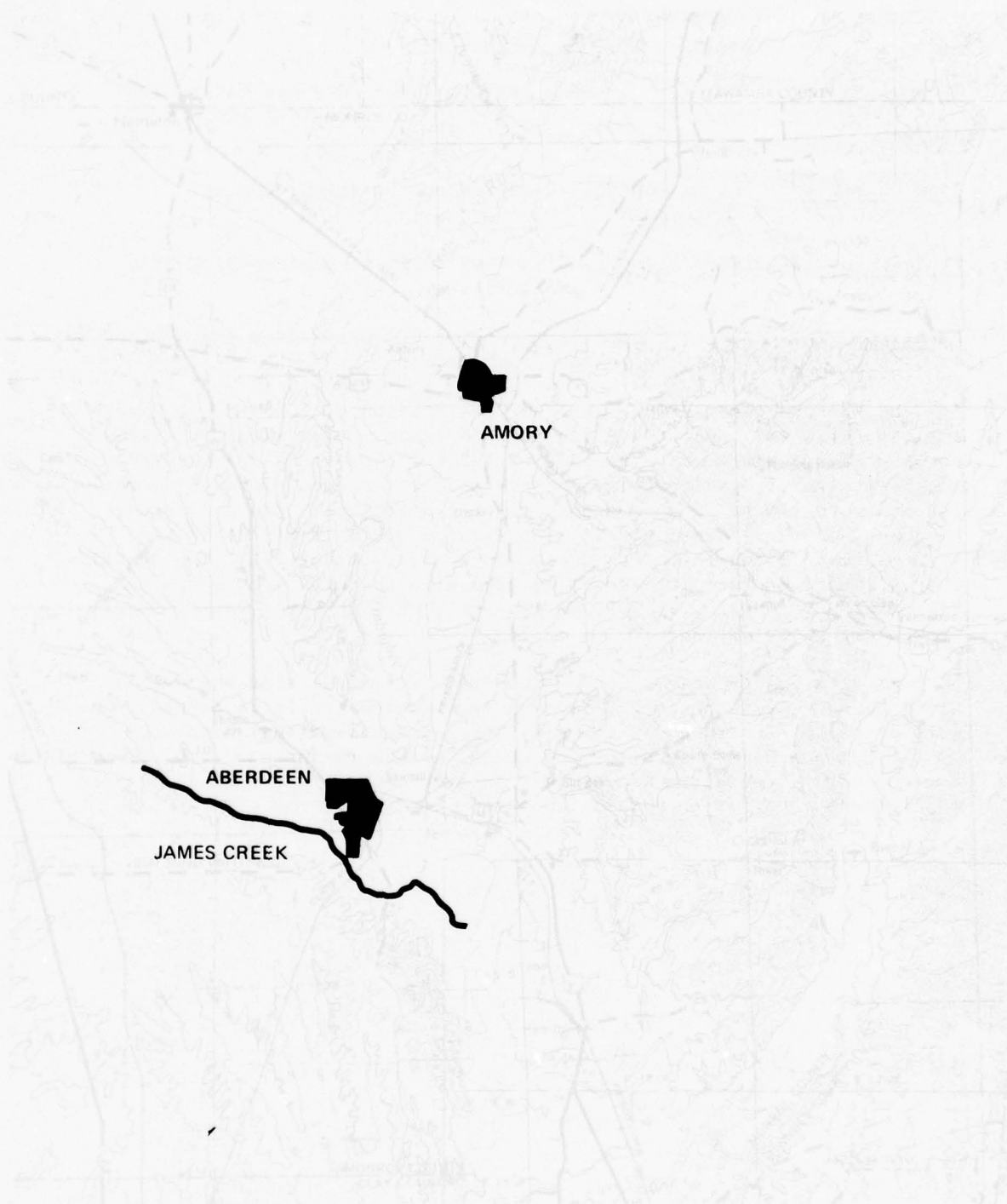
Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: The projects extend from a point 0.3 miles from the Oktibbeha
County line to the Tombigbee River.

Project Description: Enlargement and realignment of the Noxubee River will increase its capacity to drain flood water. Approximately 49,200 acres of flood plain are affected, of which 14,400 acres are cleared for agricultural development. The project will reduce overbank flooding and permit more intensive agricultural practices. Based on House Document No. 167, 84th Congress, 1st session dated 18 May 1955, the economic benefits expected to accrue to the project are \$127,600 annually. The estimated project cost is \$1,487,200 with the U.S. Army Corps of Engineers contributing \$1,280,000 and the Tombigbee River Valley Water Management District \$207,200.

Mississippi's Outdoor Recreation Plan recommends that the Noxubee River become a scenic river. This recommendation conflicts directly with plans to construct new channels, or realign existing channels, of the Noxubee River, as described above. It is recommended that flood control work proposed in the project described above not include channel realignment in order to retain the scenic quality of the river.

FIGURE 34
JAMES CREEK FLOOD CONTROL PROJECT



V-96-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 23

Project Name: James Creek Flood
Control Project

County: Monroe

Type of Project: Flood Control, Clearing and Snagging, and Channel
Improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: This project is located in the vicinity of Mississippi Highway No. 8, about three miles west of Aberdeen, Mississippi, and extends to the Tombigbee River.

Project Description: This project consists of clearing and snagging of the stream and will increase its capacity to drain flood water. Flooding occurs on an average of seven times per year and affects approximately 2000 acres of land. Flood losses average about \$21,000 resulting largely from damage to crops. This project is estimated to cost approximately \$129,000. Cost will be shared by the U.S. Army Corps of Engineers (\$87,000) and the Tombigbee River Valley Water Management District (\$42,000). This project is approximately 3.0 percent complete as of March 1968. All other work scheduled on the stream is programmed for completion in Fiscal Year 1968-69.

FIGURE 35

MACKEYS CREEK WILDLIFE MANAGEMENT AREA

MACKEYS CREEK
WILDLIFE MANAGEMENT AREA

TENNESSEE - TOMBIGBEE WATERWAY



V-98-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 24

Project Name: Mackeys Creek Wildlife Management Area

County: Itawamba, Prentiss

Type of Project: Wildlife

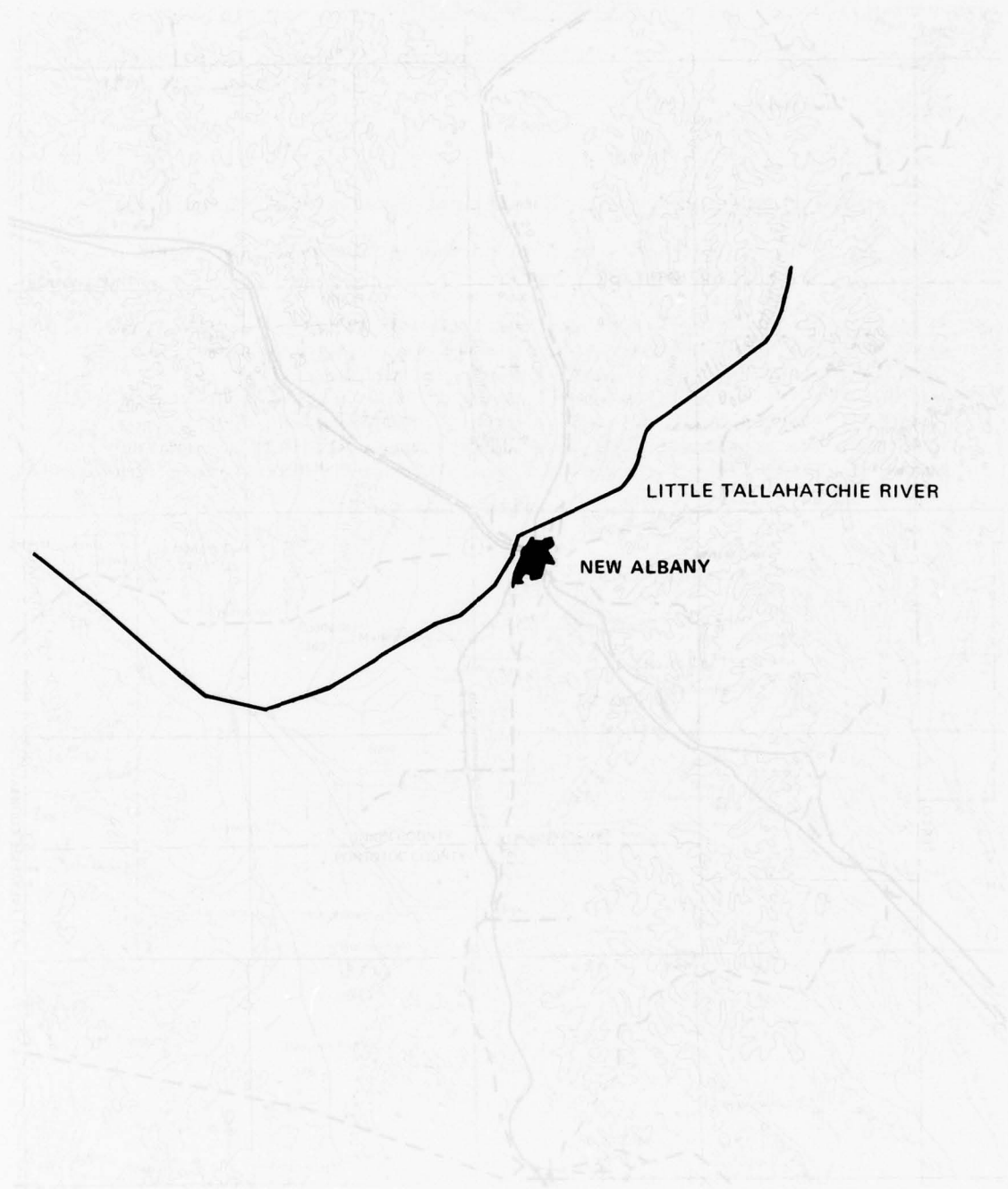
Project Identification Agency: Mississippi Game and Fish Commission

Location: The project is located in northeast Itawamba County and southwest Prentiss County.

Project Description: This project was recently proposed by the State Game and Fish Commission as a new upland game management area. Closely paralleling the Mississippi Appalachian Regional Development plan, which calls for recreational development in this area around a large reservoir (Bay Springs) created as part of the Tennessee-Tombigbee Waterway, the proposed 10,700 acre Mackeys Creek Wildlife Management Area offers excellent potential for recreation and wildlife development.

FIGURE 36

TALLAHATCHIE RIVER PROJECT



V-100-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 25

Project Name: Tallahatchie River
Project

County: Union

Type of Project: Feasibility Study

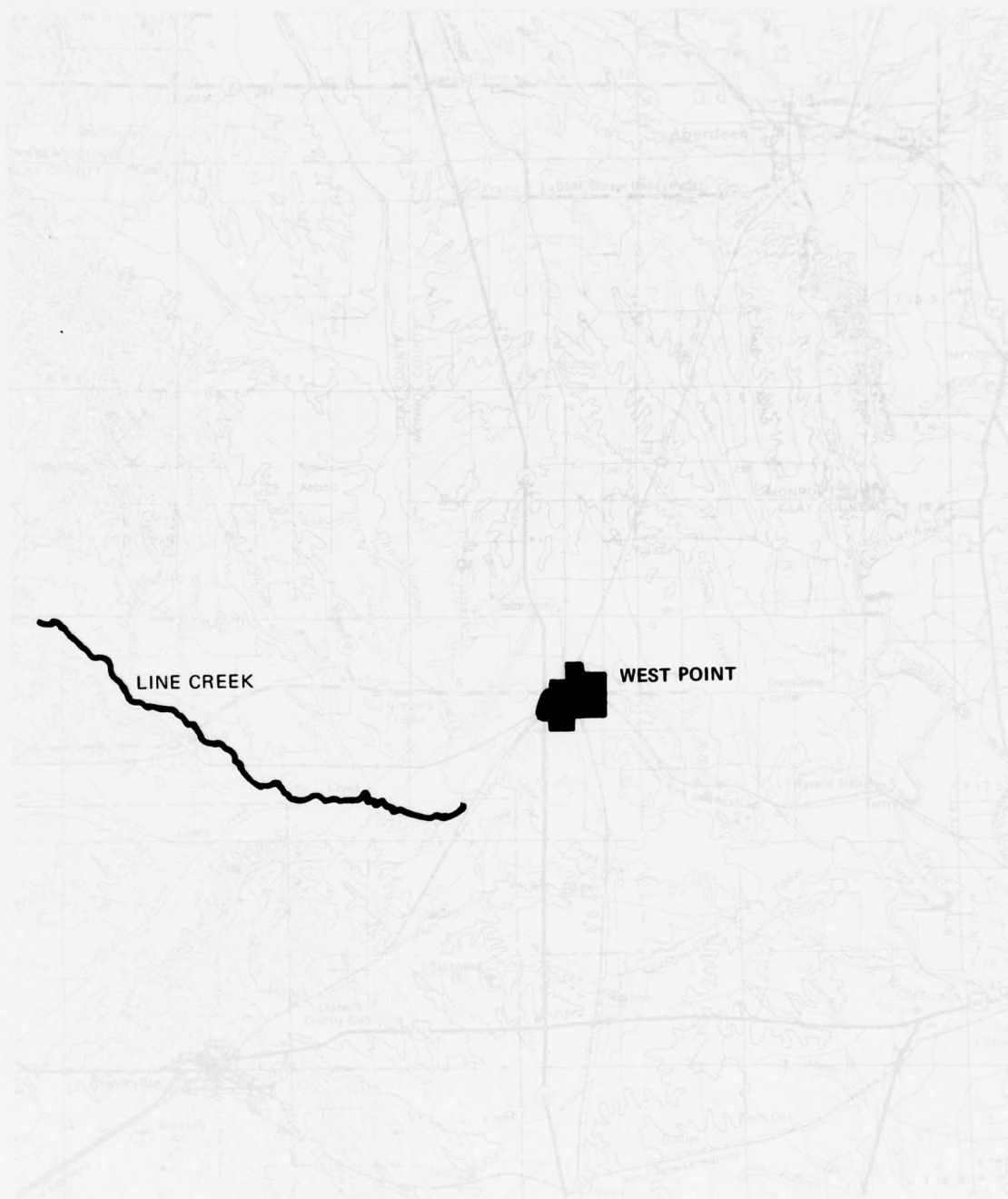
Project Identification Agency: City of New Albany

Location: This project extends from the Lafayette County line on the northwest through the City of New Albany to the Tippah County line on the northeast.

Project Description: This project has not been studied by the Soil Conservation Service or by the U.S. Army Corps of Engineers. However, considerable damage is sustained by the City of New Albany and by agricultural areas in the county. Apparently, backwater problems during high water period cause problems of health and sanitation to some residential areas due to sewage overflow. This project is recommended for study to determine the feasibility of flood control, multi-purpose reservoir sites, and recreation development.

FIGURE 37

LINE CREEK FLOOD CONTROL PROJECT



V-102-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 26

Project Name: Line Creek Flood
Control Project

County: Clay and Oktibbeha

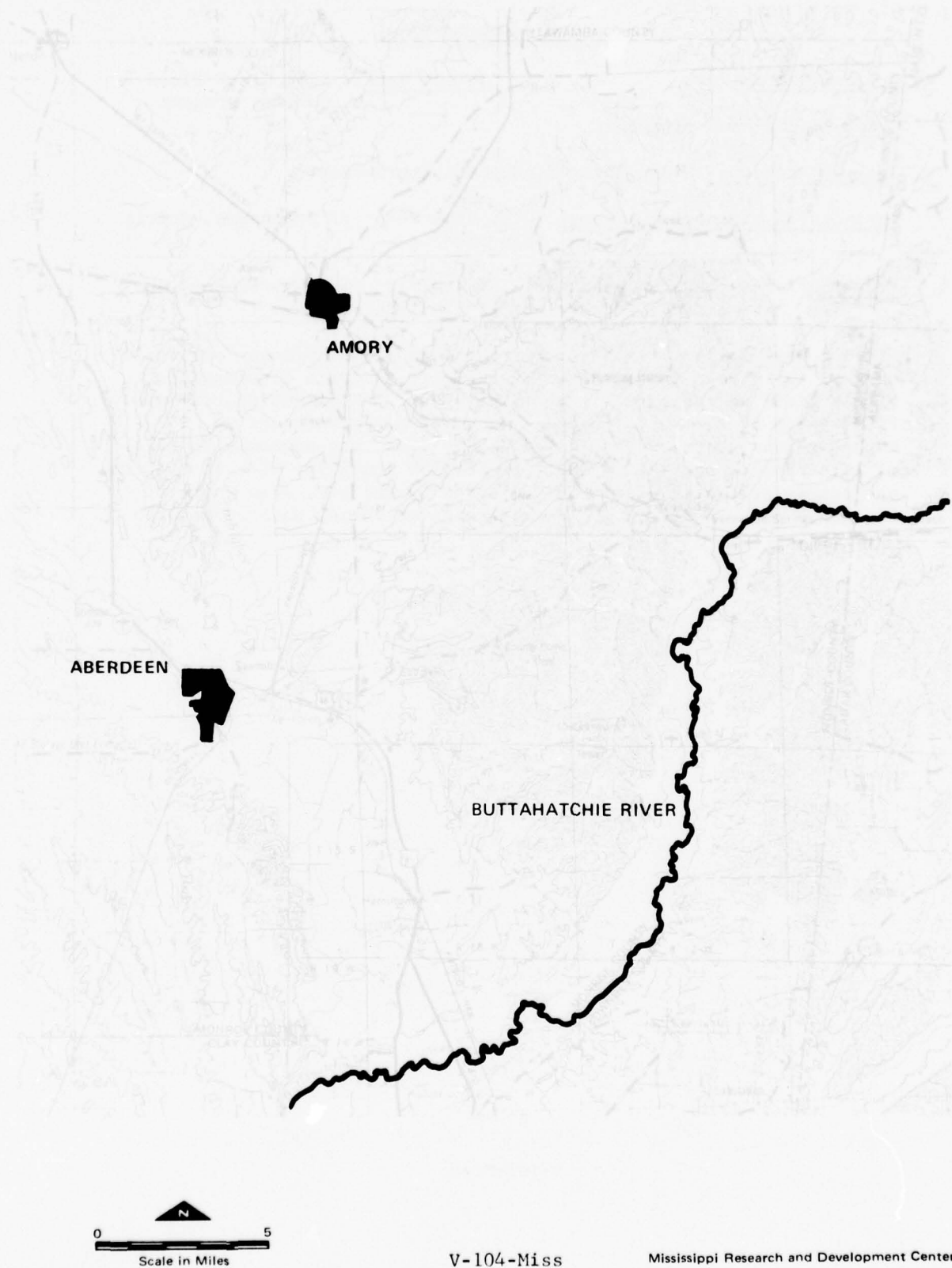
Type of Project: Flood Control, Channel Improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: This project begins at the junction of Johnson Creek and
North Canal and extends to the Tibbee River.

Project Description: This project consists of enlargement and realignment of the stream to increase its capacity to drain floodwaters. Floods occur an average of five times a year and affect approximately 8,800 acres of flood plain land. Based on House Document No. 167, 84th Congress, 1st Session, dated 18 May 1955, the economic benefits of this project are estimated to be \$69,900 annually. The cost of the project is estimated at \$1,290,000 borne by the U.S. Army Corps of Engineers and \$94,500 by the Tombigbee River Valley Water Management District.

FIGURE 38
BUTTAHATCHIE RIVER FLOOD CONTROL PROJECT



V-104-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 27

Project Name: Buttahatchie River
Flood Control Project

County: Monroe, Lowndes

Type of Project: Flood Control and Channel Improvement

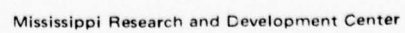
Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: The project extends from a point 2.5 miles south of Henson
Springs, Alabama, to the Tombigbee River.

Project Description: This project consists of enlargement and realignment of the stream to increase its capacity to drain flood water. Floods along the Buttahatchie occur an average of 7.4 times each year, inundating 9,800 acres of agricultural land. Based on House Document No. 167, 84th Congress, 1st Session, dated 18 May 1955, the economic benefits accruing to the project are \$264,300 annually. Total project cost is estimated at \$3,005,200 with the U.S. Army Corps of Engineers contributing \$2,740,000 and the Tombigbee River Valley Water Management District \$265,200.

Mississippi's Outdoor Recreation Plan recommends that the Buttahatchie River become a scenic river. This recommendation conflicts directly with plans to construct new channels, or realign existing channels of the Buttahatchie River. It is recommended that flood control work proposed in the project described above not include channel realignment in order to retain the scenic quality of the River.

A topographic map of the Houston area, Texas. The map shows the Houston Ship Channel, which is a large body of water extending from the Gulf of Mexico into the city of Houston. The city of Houston is marked with a large black square. The map includes labels for various geographical features, including the Gulf of Mexico, the Houston Ship Channel, and the city of Houston. The map also shows the surrounding land area, including the Houston Ship Channel and the Gulf of Mexico. The map is oriented with North at the top.



PROJECT DESCRIPTION

Project Number: 28

Project Name: Houlka Creek Flood
Control Project

County: Clay and Chickasaw

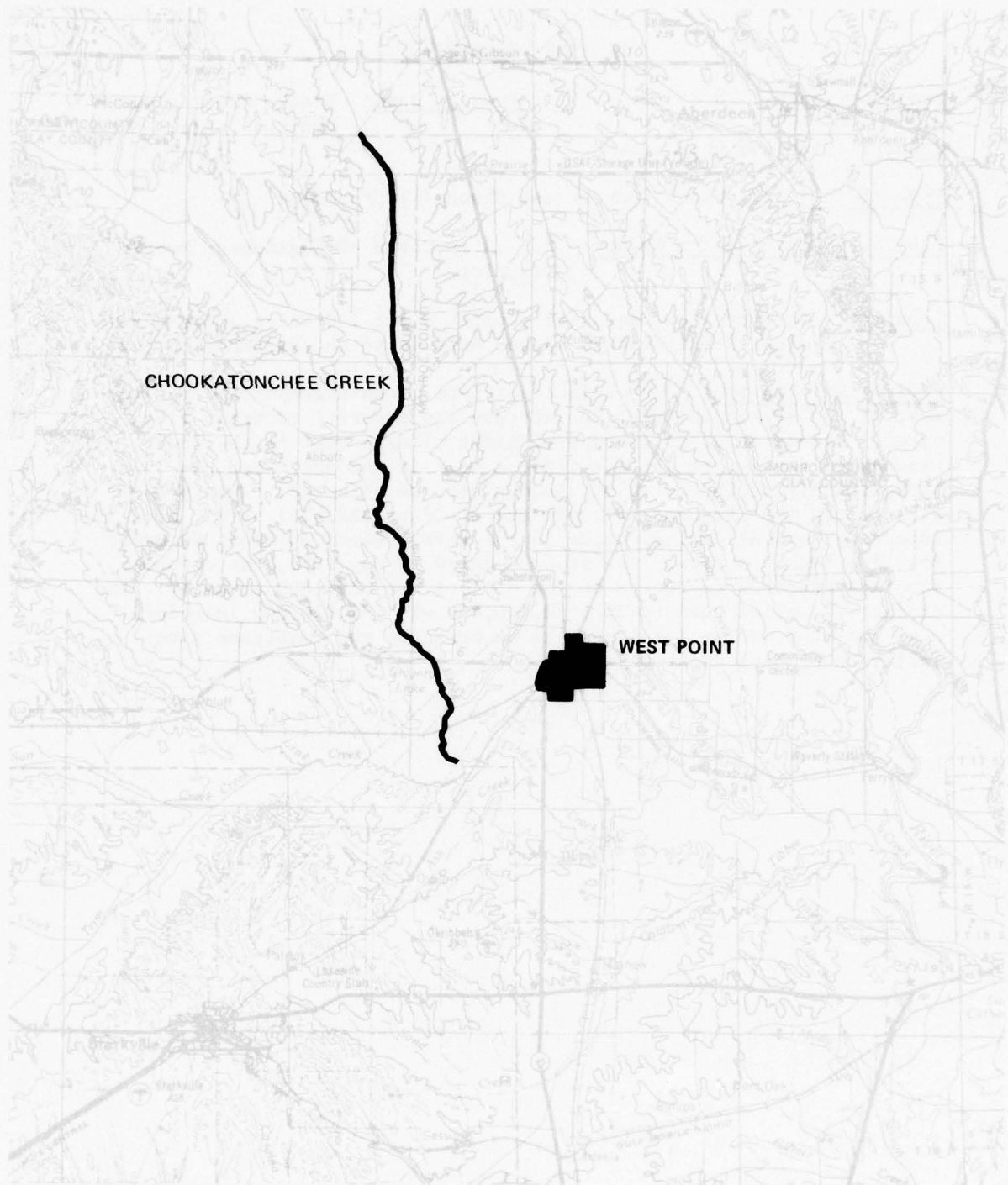
Type of Project: Flood Control and Channel Improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: This project begins at a point about 1.0 miles above Mississippi State Highway 15 and extends to Chookatonchee Creek.

Project Description: The project consists of enlargement and realignment of the stream in order to increase its capacity to drain flood water. Floods occur an average of eight times a year in the lower reaches of the stream and six times a year in the upper reaches. Approximately 16,000 acres of flood plain are affected. This project will reduce the frequency of overbank flooding and will permit more intensive agricultural practice in the area. Based on House Document No. 169, 84th Congress, 1st Session, dated 18 May 1955, the economic benefits expected to accrue to the project are \$301,800 annually. The project is anticipated to cost \$2,006,400 with \$1,800,000 in federal cost and \$206,400 in local cost to be borne by the Tombigbee River Valley Water Management District.

FIGURE 40
CHOOKATONCHEE CREEK FLOOD CONTROL PROJECT



V-108-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 29

Project Name: Chookatonchee Creek^{*/}
Flood Control Project

County: Clay

Type of Project: Flood Control, Drainage, Wildlife, Recreation and
Soil Conservation

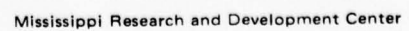
Project Identification Agency: U.S. Department of Agriculture,
Soil Conservation Service
U.S. Army Corps of Engineers

Location: This project begins at the confluence of the Tibbee River
and extends to the Clay County line.

Project Description: This project consists of enlargement and realignment of the stream to increase its capacity to drain flood water. Floods occur an average of 8 times a year in the lower reaches and 11 times a year in the middle reaches, and 6 times a year in the upper reaches. Approximately 24,200 acres of flood plain are affected. This project will reduce the frequency of overbank flooding and permit more intensive agricultural use of the flood plain. Based on House Document No. 167, 84th Congress, 1st Session, dated 18 May 1955, the economic benefits accruing to the project are \$336,000 annually. The project is estimated to cost \$3,003,300 with Federal cost of \$2,700,000 and \$303,300 in local cost to be borne by the Tombigbee River Valley Water Management District.

^{*/} Also referred to as Sakatonchee Creek.

A topographic map of the West Point area in Mississippi. The map shows contour lines, roads, and various geographical features. A black silhouette of the West Point area is overlaid on the map, with the labels "WEST POINT" and "TOWN CREEK" placed next to it. The map also shows the locations of Starkville, Aberdeen, and other nearby towns. The map is oriented with North at the top.



PROJECT DESCRIPTION

Project Number: 30

Project Name: Town Creek Flood
Control Project
West Point, Miss.

County: Clay

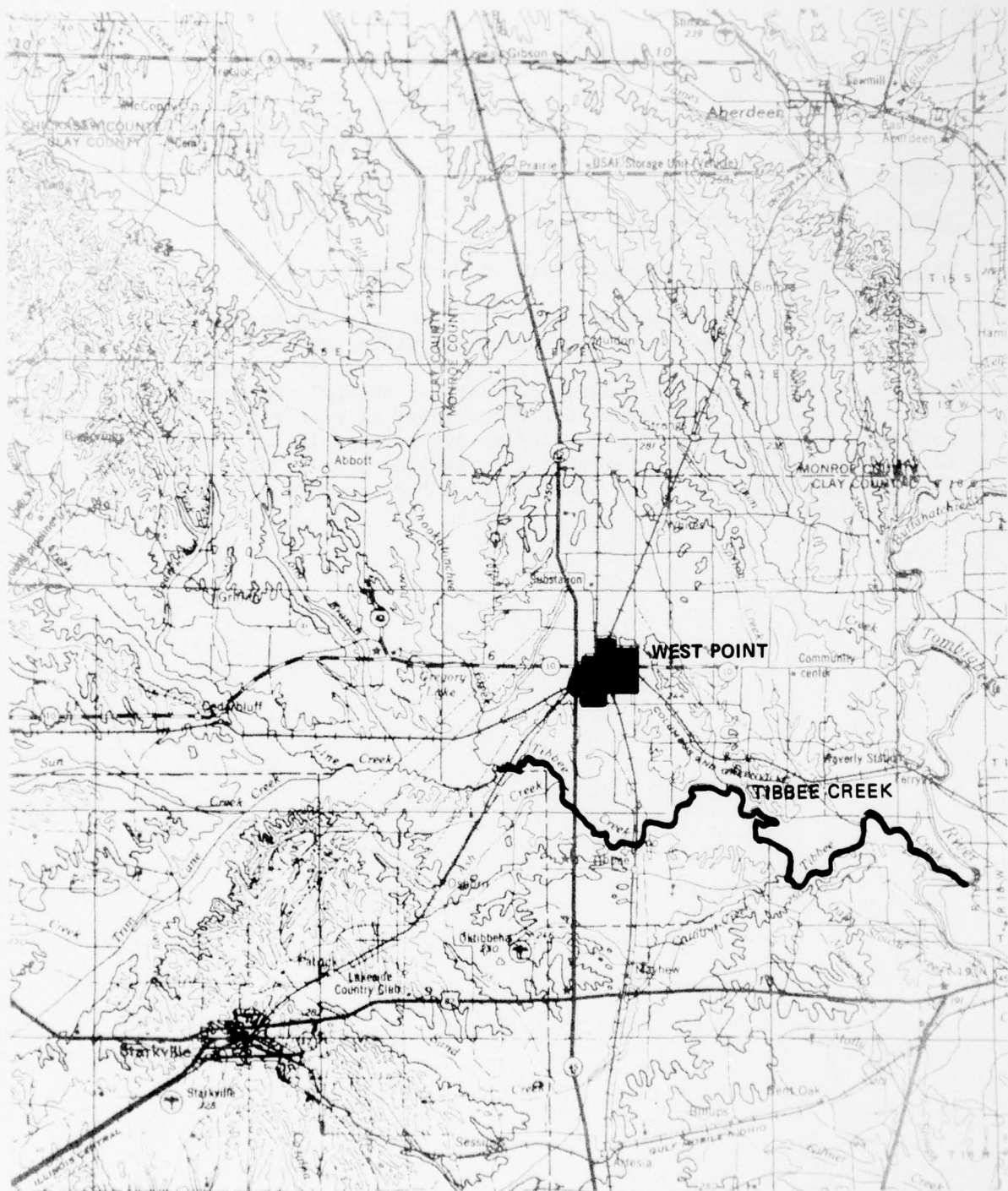
Type of Project: Feasibility Study

Project Identification Agency: City of West Point

Location: The project begins northwest of the city limits of the City
of West Point and extends to the Tibbee River.

Project Description: The project consists of channel improvement to
eliminate flooding within the corporate limits of West Point, Mississippi.
Estimates of cost and economic benefits are not available; however,
elimination of flooding in a built-up urbanized area is often feasible.
This project should be given consideration for study to eliminate the
flooding problem.

FIGURE 42
TIBBEE CREEK FLOOD CONTROL PROJECT



V-112-Miss

Mississippi Research and Development Center

PROJECT DESCRIPTION

Project Number: 31

Project Name: Tibbee Creek Flood
Control Project

County: Clay and Lowndes

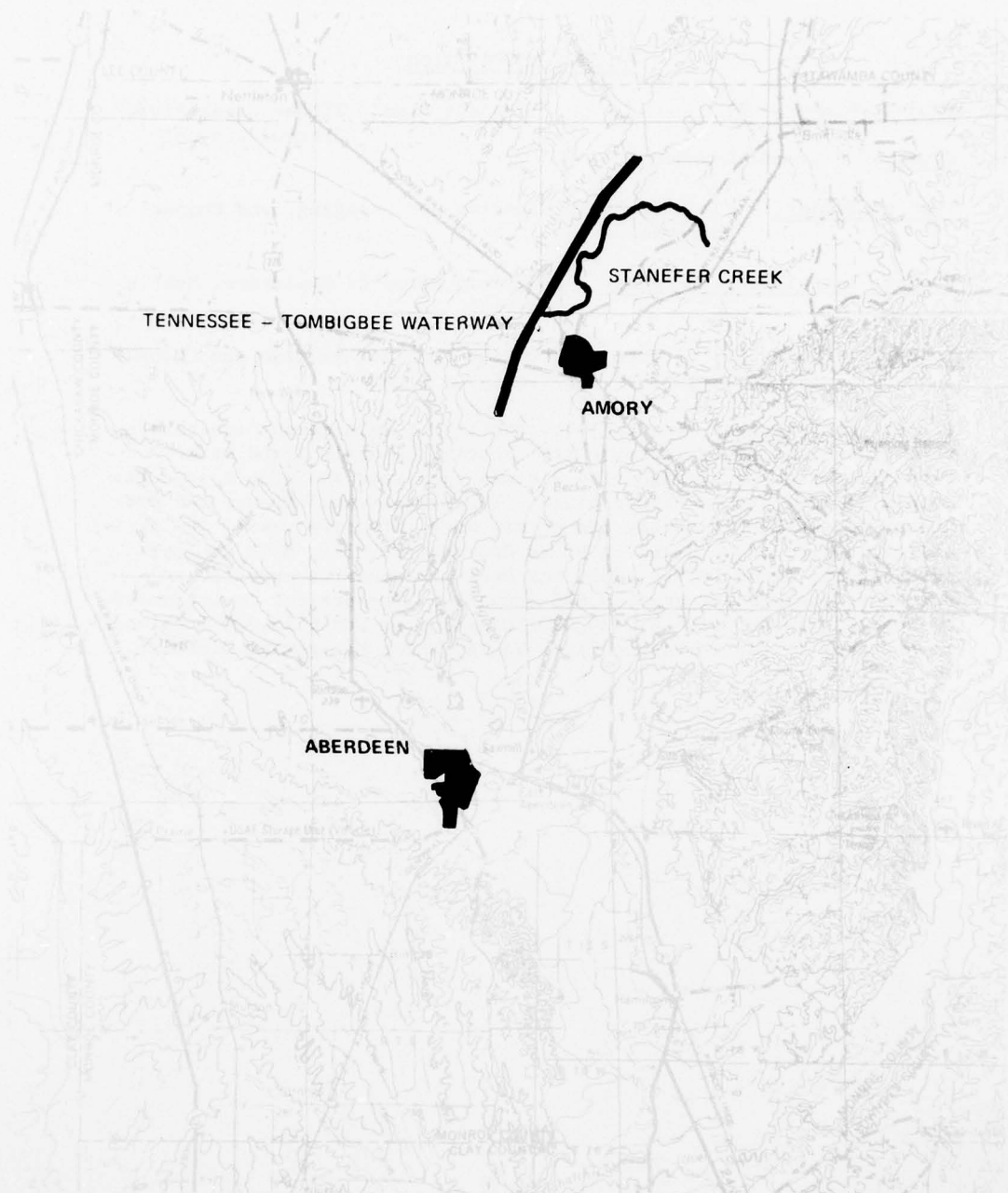
Type of Project: Flood Control, Clearing and Snagging, and Channel
Improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: This project extends from the junction of Line and Chooka-
tonchee Creeks to the Tombigbee River.

Project Description: The project consists of enlargement and realign-
ment of the stream to increase its capacity to drain flood water.
Floods occur on an average of 4.2 times each year and affect approxi-
mately 11,800 acres of flood plain. The project will reduce the fre-
quency of overbank flooding and permit more intensive use of the agri-
cultural practices. Based on House Document No. 167, 84th Congress,
1st Session, dated 18 May 1955, the economic benefits expected to
accrue to the project are \$69,800 annually. The project is estimated
to cost \$1,239,700 with \$1,120,000 federal cost and \$119,700 local cost
to be borne by the Tombigbee River Valley Water Management District.

FIGURE 43
STANEFER CREEK FLOOD CONTROL PROJECT



PROJECT DESCRIPTION

Project Number: 32

Project Name: Stanefer Creek Flood
Control Project

County: Monroe

Type of Project: Flood Control, Channel Improvement

Project Identification Agency: U.S. Army Corps of Engineers, Mobile
District

Location: The project extends from Mississippi Highway 25 in Monroe
County to the confluence of Stanefer Creek with the East
Fork of the Tombigbee River.

Project Description: The project consists of enlargement and realignment of the creek to increase its capacity to drain flood water. Floods occur on an average of eleven times each year and affect approximately 5,600 acres of flood plain. Flood losses, largely to agriculture, amount to more than \$26,800 on an average annual basis. The project will reduce the frequency of overbank flooding and permit more intensive agricultural development. Average annual benefits expected to accrue to the project are \$41,100. The project is estimated to cost \$368,000 with \$235,000 federal cost and \$133,000 local cost to be borne by the Tombigbee River Valley Water Management District.

Other Water Resource Development Projects

The water and related resource projects listed below were submitted by all segments of private and public agencies concerned with water and related resource conservation and development. The projects are identified by Regional Economic Area and County. The type, function, estimated cost and sponsor or planning agency are shown for projects.

REGIONAL ECONOMIC AREA I

1. South Canal

Location: Clay County
Project Type: Channel Improvement, Flood Control
Function: Control of major flooding
Planning Agency: U.S. Army Corps of Engineers, Mobile District
Estimated Cost: \$164,900

2. Johnson Creek

Location: Clay County
Project Type: Channel improvement, Flood Control
Function: Control of major flooding
Planning Agency: U.S. Army Corps of Engineers, Mobile District
Estimated Cost: \$53,000

3. North Canal

Location: Clay County
Project Type: Channel Improvement, Flood Control
Function: Control of major flooding
Planning Agency: U.S. Army Corps of Engineers, Mobile District
Estimated Cost: \$170,000

4. Sun Creek

Location: Clay County
Project Type: Flood Control, Drainage, Soil Conservation
Function: Channel Improvement
Planning Agency: USDA, Soil Conservation Service
Estimated Cost: Unknown

REGIONAL ECONOMIC AREA I (Cont'd.)

5. Sucarnoochee Creek

Location: Kemper
Project Type: Multi-purpose Reservoir
Function: Flood Prevention, Recreation, Industrial
and Municipal Water Supply
Sponsor: Mississippi Association of Soil Conservation
District Commissioners
Estimated Cost: Unknown

6. Honnoll's Mill Creek

Location: Lowndes County
Project Type: Flood Control, Recreation, Soil Conservation
Function: Control of Stream Overflow
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

7. Mayb Creek

Location: Lowndes County
Project Type: Flood Control, Drainage, Soil Conservation
Function: Control of Major Flooding
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

8. Magowah Creek

Location: Lowndes County
Project Type: Flood Control, Soil Conservation, Recreation and
Wildlife
Function: Control of Major Flooding
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

9. Ellis Creek

Location: Lowndes County
Project Type: Flood Control, Soil Conservation, Recreation and
Wildlife
Function: Control of Major Flooding
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

REGIONAL ECONOMIC AREA I (Cont'd.)

10. Duck Slough

Location: Lowndes County
Project Type: Drainage
Function: Drainage of low, wet area - to provide agricultural land
Sponsor: Soil Conservation District
Estimated Cost: Unknown

11. McCrory Creek

Location: Lowndes County
Project Type: Flood Control
Function: Control of Major Flooding
Planning Agency: USDA Soil Conservation Service
Sponsor: Northeast Mississippi Resource Conservation and Development Organization
Estimated Cost: Not available

12. Drainage Ditches in Starkville, Mississippi

Location: City limits of Starkville
Project Type: Drainage
Function: Clearing and snagging of drainage ditches to provide better surface drainage
Sponsor: City of Starkville
Estimated Cost: \$75,000

13. Sun Creek

Location: Clay, Oktibbeha Counties
Project Type: Flood Control
Function: Enlargement and realignment of stream channel to reduce flooding
Planning Agency: U.S. Army Corps of Engineers, Mobile District
Estimated Cost: \$344,700

REGIONAL ECONOMIC AREA I (Cont'd.)

14. Trim Cane Creek

Location: Oktibbeha County
Project Type: Flood Control
Function: Enlargement and realignment of channel to reduce flooding
Planning Agency: U.S. Army Corps of Engineers, Mobile District
Estimated Cost: \$315,000

15. Lake near Starkville

Location: Oktibbeha County
Project Type: Multi-purpose Reservoir
Function: Basically recreation
Sponsor: City of Starkville
Estimated Cost: Unknown

16. Multi-Purpose Reservoir in Webster County

Function: Floodwater retarding structure for all forms of public outdoor recreation
Planning Agency: U.S.D.A. Soil Conservation Service
Sponsor: Webster County Board of Supervisors
Estimated Cost: Unknown

17. Yazoo Creek

Location: Kemper County
Project Type: Multi-purpose Reservoir
Function: Control of flooding on Yazoo Creek, serve recreational needs of DeKalb and surrounding area
Sponsor: City of DeKalb
Estimated Cost: Unknown

18. Sucarnoochee Creek

Location: Kemper County
Project Type: Recreation Lake
Function: Serve county recreational needs
Planning Agency: USDA Soil Conservation Service
Sponsor: City of DeKalb
Estimated Cost: Unknown

REGIONAL ECONOMIC AREA I (Cont'd.)

19. Pawticfaw, Blackwater, Sucarnoochee Creeks

Location: Kemper County
Project Type: Channel Improvement
Function: To prevent flooding and crop damage
Planning Agency: USDA Soil Conservation Service
Sponsor: City of DeKalb
Estimated Cost: Not available

20. Noxubee River

Location: Noxubee and other counties
Project Type: Research
Function: Preparation of water appraisals and mapping as
background data for making decisions concerning
available ground water resources
Planning Agency: U.S. Geological Survey
Estimated Cost: \$75,000 (Five-county study)

21. Upper Pearl River

Location: Winston and four other counties
Project Type: Research
Function: Preparation of water appraisals and mapping as
background data for making decisions concerning
available ground water resources
Planning Agency: U.S. Geological Survey
Estimated Cost: \$75,000

22. Lake Lowndes Recreation Center

Location: Lowndes County
Project Type: Recreation, Flood Control, Soil Conservation,
Multi-purpose Reservoir
Function: To provide much needed outdoor, water-related
public recreation facilities for the Columbus
area
Sponsors: Mississippi Park System
Columbus-Lowndes Recreation Commission
Estimated Cost: \$500,000

REGIONAL ECONOMIC AREA I (Cont'd.)

23. Black Creek

Location: Lowndes County
Project Type: Flood Control, Soil Conservation, Recreation
Function: To provide drainage, soil conservation, and
flood prevention for agricultural land
Planning Agency: U.S. Soil Conservation Service
Estimated Cost: Unknown

24. Oktibbeha County Recreation Facilities

Location: Oktibbeha County
Project Type: Recreation
Function: Provide recreational facilities for the county
Sponsor: Starkville Chamber of Commerce
Estimated Cost: Unknown

25. Kemper County Lake and Recreation Area

Location: Kemper County
Project Type: Recreation
Function: Provide lake and area for outdoor and water-based
recreation
Sponsor: DeKalb Mayor and Board of Aldermen
Estimated Cost: Unknown

26. Oktibbeha County Recreational Lake Road and Bridge

Location: Oktibbeha County
Project Type: Recreation
Function: Provide recreational lake road and bridge
Sponsor: Oktibbeha County Board of Supervisors
Estimated Cost: \$140,000

27. Noxubee River

Location: Noxubee County
Project Type: Multi-Purpose Reservoir
Function: Recreation, Water Supply
Sponsor: Noxubee County Board of Supervisors
Estimated Cost: Unknown

REGIONAL ECONOMIC AREA I (Cont'd.)

28. Sucarnoochee River

Location: Kemper County
Project Type: Research
Function: Preparation of water appraisals and mapping as
background data for requests for water resource
information by industry
Planning Agency: U.S. Geological Survey
Estimated Cost: \$75,000

REGIONAL ECONOMIC AREA II

1. Tallabinnela Creek

Location: Monroe County
Project Type: Flood Control, Channel Improvement, Recreation
Function: Control of major flooding, creation of recreational
land
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

2. Buttahatchie River

Location: Monroe-Lowndes County Line
Project Type: Research
Function: Studies to determine the feasibility of providing
navigation and/or flood control dams on the
Buttahatchie River
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

REGIONAL ECONOMIC AREA III

1. Hohenlinden Creek

Location: Chickasaw and Webster Counties
Project Type: Flood Control
Function: Control of flooding, erosion, and drainage
Planning Agency: USDA Soil Conservation District
Estimated Cost: \$700,000

2. Bull Mountain Creek

Location: Itawamba County
Project Type: Multi-purpose Reservoir
Function: Flood Control and water-based recreation
Sponsor: Northeast Mississippi Soil Conservation District
Commissioners
Estimated Cost: Not Available

3. Twenty-Mile Creek

Location: Itawamba County
Project Type: Flood Control
Function: Control of major flood hazard
Planning Agency: U.S. Army Corps of Engineers
Estimated Cost: \$1,164,000

4. Mantachie Creek

Location: Itawamba County
Project Type: Flood Control
Function: Enlarge, clear, snag channel to prevent further flooding
Planning Agency: U.S. Army Corps of Engineers
Estimated Cost: \$99,000

5. Big Browns Creek

Location: Itawamba and Prentiss Counties
Project Type: Flood Control
Function: Channel enlargement to eliminate major flood problems
Planning Agency: U.S. Army Corps of Engineers
Estimated Cost: \$248,300

REGIONAL ECONOMIC AREA III (Cont'd.)

6. Little Browns Creek (East Prong)

Location: Prentiss and Itawamba Counties
Project Type: Flood Control, Channel Improvement
Function: Increase capacity of channel to drain flood water
Planning Agency: U.S. Army Corps of Engineers

7. Big Mud Creek

Location: Pontotoc and Union Counties
Project Type: Flood Control
Function: Increase capacity of channel to drain flood water
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Not Available

8. Chiwapa Creek and Lappatubby Creek

Location: City of Pontotoc
Project Type: Flood Control
Function: Prevent flooding of urbanized areas of Pontotoc
Sponsor: City of Pontotoc
Estimated Cost: Unknown

9. Chiwapa Creek

Location: Pontotoc County
Project Type: Multi-purpose Reservoir
Function: Control of flooding and improved outdoor recreation facilities
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

10. Upper Skuna River

Location: Pontotoc and Chickasaw Counties
Project Type: Flood Control, Soil Conservation, Drainage
Function: To control flooding by increasing capacity of stream to drain flood water
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$511,000

REGIONAL ECONOMIC AREA III (Cont'd.)

11. Toccopola Creek

Location: Pontotoc County
Project Type: Flood Control, Soil Conservation, Drainage
Function: To control flooding by increasing capacity of
stream to drain flood water
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$2,900,000

12. Extreme Upper Town Creek

Location: Pontotoc County
Project Type: Flood Control, Recreation
Function: Clearing and snagging of Town Creek and laterals
to prevent flooding and erosion
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

13. Cane and Duncan Creeks

Location: Pontotoc County
Project Type: Flood Control, Channel Improvement
Function: Provide drainage, prevent serious flooding
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$585,000

14. Okonnatie Creek

Location: Union and Pontotoc Counties
Project Type: Flood Control
Function: Channel Improvement to prevent flooding and pro-
vide better drainage
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Not Available

15. Locks Creek

Location: Union County
Project Type: Flood Control Dam
Function: Prevent serious flooding and conserve soils
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$46,674

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CORPS OF ENGINEERS CINCINNATI OHIO
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
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REGIONAL ECONOMIC AREA III (Cont'd.)

16. Lower Tallahatchie River

Location: Union County
Project Type: Flood Control, Channel Improvement
Function: To conserve soils, provide better drainage
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Unknown

17. Okannatie Creek

Location: Union and Pontotoc Counties
Project Type: Flood Control, Clearing and Snagging, Channel
Enlargement
Function: Control flooding and conserve soils
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Not Available

18. Hell Creek

Location: Union, Tippah and Benton Counties
Project Type: Flood Control
Function: Drainage, Flood Control, Soil Conservation
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$789,000

19. Mills Creek

Location: Union and Marshall Counties
Project Type: Flood Control
Function: Prevent flooding and conserve soils by proper
drainage
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$751,761

20. Damnation Creek

Location: Union County
Project Type: Multi-purpose Reservoir, Flood Control
Function: Provide recreation, water supply for New Albany
Sponsor: City of New Albany
Estimated Cost: Not Available

REGIONAL ECONOMIC AREA III (Cont'd.)

21. Bridge Creek

Location: Union County
Project Type: Flood Control, Multi-purpose Reservoir
Function: To reduce erosion, sediment and flooding and provide recreation
Sponsor: Union County Board of Supervisors
Estimated Cost: \$320,085

22. Sawmill Creek

Location: Union County
Project Type: Flood Control, Multi-purpose Reservoir
Function: To reduce erosion, sediment damage and flooding and to provide recreation
Sponsor: Union County Board of Supervisors
Estimated Cost: \$449,483

23. Northeast Mississippi Recreational Development Project

Location: Shannon, Mississippi (Lee County)
Project Type: Recreation
Function: Construct a recreational lake, club house, 9-hole golf course; purchase 110-acre tract of land for recreational area
Sponsor: Northeast Mississippi Recreation Association
Estimated Cost: Unknown

24. Lee County Community Recreation Park Project

Location: Lee County
Project Type: Recreation
Function: Assist communities in the County in purchasing, planning, and developing community recreation parks
Sponsor: Lee County Board of Supervisors, Lee County Board of SCD Commissioners
Estimated Cost: \$5,000 and up

REGIONAL ECONOMIC AREA III (Cont'd.)

25. Pontotoc Recreational Lake

Location: Pontotoc County
Project Type: Recreation
Function: Provide outdoor, water-related recreation
Sponsor: City of Pontotoc, Board of Aldermen
Estimated Cost: \$121,331

26. Donivan Creek

Location: Itawamba and Prentiss Counties
Project Type: Flood Control
Function: Channel improvement to prevent flooding and provide better drainage for the area
Planning Agency: U.S. Army Corps of Engineers
Estimated Cost: Not Available

REGIONAL ECONOMIC AREA IV

1. Muddy Creek

Location: Tippah County
Project Type: Flood Control, Multi-purpose Reservoir
Function: Prevent downstream crop and real estate damage
and provide recreation
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$350,000

2. Cane Creek

Location: Tippah County and Union County
Project Type: Flood Control
Function: Prevention of flood and sediment damage
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$218,000

3. Tuscumbia River

Location: Alcorn County, near Corinth
Project Type: Multi-purpose Reservoir
Function: Provide water supply for Corinth and water-based
recreation
Planning Agency: U.S. Army Corps of Engineers
Estimated Cost: Not Available

4. Tuscumbia River

Location: Alcorn, Itawamba, Prentiss, and Tishomingo Counties
Project Type: Research
Function: Preparation of water appraisals and mapping as
background data for requests for water resource
information by industry
Planning Agency: U.S. Geological Survey
Estimated Cost: \$80,000

5. Tippah County Recreational Lake

Location: Tippah County
Project Type: Recreation
Function: Provide outdoor, water-related recreation
Sponsor: Tippah County Board of Supervisors
Estimated Cost: \$350,000

REGIONAL ECONOMIC AREA IV (Cont'd.)

6. Community Service and Recreational Center

Location: Southwest City Limits of Corinth (Alcorn County)
Project Type: Recreation
Function: Provide a community center, golf course, picnic area, etc.
Sponsor: City of Corinth and Alcorn County
Estimated Cost: \$725,000

7. Yellow Creek

Location: Tishomingo County, on Lake Pickwick
Project Type: Recreation
Function: Provide facilities to satisfy recreation demand

Sponsor: Yellow Creek Watershed Authority
Estimated Cost: \$30,000

8. Tuscumbia River

Location: Prentiss County near Booneville
Project Type: Multi-purpose Reservoir
Function: Flood Control, Water Supply for Booneville, Recreation
Sponsor: Tuscumbia Drainage District
Estimated Cost: Not Available

9. Rock Creek or Ebenezer Creek

Location: Tishomingo County
Project Type: Multi-purpose Reservoir (250 acres)
Function: Provide flood control, water supply and recreation
Planning Agency: USDA Soil Conservation Service
Estimated Cost: Not Available

10. Goat Island Camping Area

Location: Pickwick Lake, Tishomingo County
Project Type: Recreation
Function: Development of recreational facilities principally for campers
Sponsor: Yellow Creek Watershed Authority
Estimated Cost: \$30,000

REGIONAL ECONOMIC AREA V

1. Pigeon Roost Creek

Location: Marshall County
Project Type: Flood Control
Function: Reduce sediment damage, flooding and drainage problems
Planning Agency: U.S. Soil Conservation Service

2. Coldwater River

Location: Marshall and Benton Counties
Project Type: Flood Control, Wildlife Project, Soil Conservation
Function: To reduce erosion, sediment damage, flooding and drainage problems
Planning Agency: USDA Soil Conservation Service
Estimated Cost: \$7,000,000

3. Mills Creek

Location: Marshall, Union and Benton Counties
Project Type: Flood Control, Soil Conservation
Function: To reduce sediment damage, flooding, erosion and drainage problems
Planning Agency: USDA Soil Conservation Service

4. Wall Doxey State Park

Location: Marshall County
Project Type: Water Pollution Abatement, Sewage Treatment Plant, Water Distribution System
Function: To bring sewer and water standards up to specified levels
Sponsor: Mississippi Park System
Estimated Cost: Unknown

IV. RECOMMENDED RESEARCH PROJECTS

1. Noxubee River

A feasibility study is recommended to determine the extent of natural resource potential in counties adjacent to the Noxubee River. Navigation on the Noxubee River can provide for the development of many of these resources.

2. Noxubee River

A study of available ground water resources is recommended for areas of Noxubee and other counties influenced by the Noxubee River. The research project would involve the preparation of water appraisals and mapping by the U.S. Geological Survey at an estimated cost of \$75,000.

3. Water Supply Reservoir, Columbus, Mississippi

With the high growth potential likely to occur in Columbus and other portions of the "Golden Triangle" area, the feasibility of a water supply reservoir to serve the area should be investigated. The City of Columbus is particularly in need of a water supply reservoir. Its present source of water is Luxapalila Creek, which will be incapable in the near future of supplying needed water due to a Corps of Engineers Flood Control Project currently underway.

4. Upper Pearl River

A study of available ground water resources is recommended for areas of Winston and four other counties influenced by the Pearl River. The project would involve the preparation of water appraisals and mapping by the U.S. Geological Survey at an estimated cost of \$75,000.

5. Sucarnoochee River

A study of available ground water resources is recommended for Kemper County. The project would involve preparation of water appraisals and mapping by the U.S. Geological Survey at an estimated cost of \$75,000.

6. Buttahatchie River

A study is recommended to determine the feasibility of providing navigation on the Buttahatchie River. The study would be undertaken by the U.S. Army Corps of Engineers.

7. Buttahatchie River

A study is recommended to determine the feasibility of constructing a dam on the Buttahatchie River to provide flood protection, industrial and domestic water, recreation, and pollution abatement. The study would be undertaken by the U.S. Army Corps of Engineers.

8. Tuscumbia River

A study of available ground water resources is recommended for those areas of Alcorn, Itawamba, Prentiss and Tishomingo Counties drained by the Tuscumbia River. The project would involve the preparation of water appraisals and mapping by the U.S. Geological Survey at an estimated cost of \$80,000.

9. Tibbee River

A study is recommended to be undertaken by the Corps of Engineers to determine the feasibility of providing navigation on the Tibbee from the Tombigbee River to the Big Black River.

10. Tombigbee River at Columbus

A feasibility study is recommended to determine the value of constructing a levee on the west side of the Tombigbee River near Columbus to provide flood protection to potential industrial areas.

11. Bull Mountain Creek

There is need for a study to determine the feasibility for a Corps of Engineers Dam on Bull Mountain Creek in Itawamba County. The Dam would provide not only flood protection, but recreation, water supply and pollution control.

V. MUNICIPAL, SEWAGE FACILITIES, OTHER THAN ADEQUATE,
IN MISSISSIPPI APPALACHIA

Legend: 0 No Facilities
1 Planning Stage
2 Under Construction
3 Partial Treatment

ALCORN

Kosworth 0
Rienzi 0

BENTON

Hickory Flat 0

CHICKASAW

Woodland 0

CHOCTAW

Ackerman 3
French Camp 0
Mathiston 0
(also in Webster)
Weir 0

ITAWAMBA

Fulton 2

KEMPER

Electric Mills 0
Scooba 0

LEE

Guntown 0
Plantersville 0
Saltillo 0
Shannon 0

LOWNDES

Artesia 0
Caledonia 0
Columbus 2
Crawford 0
Turkey Creek 0

MARSHALL

Red Banks 0

MONROE

Amory 2
Gattman 0
Hamilton 0
Prairie 0

NOXUBEE

Brooksville 0
Macon 0

OKTIBBEHA

Adaton 0
Longview -
Naben 2
(also in Webster)
Sturgis 0

PONTOTOC

Ecrú 0
Pontotoc 3
Sherman 1
Toccopola 0

MUNICIPAL, SEWAGE FACILITIES, OTHER THAN ADEQUATE,
IN MISSISSIPPI APPALACHIA (Cont'd.)

TIPPAH

Falkner	0
Ripley	0
Walnut	0

TISHOMINGO

Burnsville	0
Paden	0

UNION

Myrtle	0
--------	---

WEBSTER

Maben	2
(also in Oktibbeha)	
Mantee	0
Mathiston	0
(also in Choctaw)	
Walthall	0

WINSTON

Louisville	3
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SOURCE: Handbook of Selected Data for Mississippi

VI. AGENCY CONTRIBUTIONS

The following list of agencies submitted water and related resource projects which greatly assisted the Center in preparing the Mississippi Supplement to the Appalachian Water Resource Plan:

1. Federal Agencies

U.S. Soil Conservation Service, State and District Offices
Tennessee Valley Authority
U.S. Geological Survey
U.S. Army Corps of Engineers, Mobile, Vicksburg, Memphis
and Nashville Districts
Farmers Home Administration

2. State and Regional Agencies

Tombigbee River Valley Water Management District
Mississippi Board of Water Commissioners
Alabama State Planning and Industrial Development Board
Tennessee-Tombigbee Waterway Development Authority
Mississippi Park System
Mississippi Forestry Commission
Mississippi State Board of Health
Mississippi Highway Commission
Mississippi Game and Fish Commission

3. Local Agencies

Yellow Creek Watershed
County Board of Supervisors (8 Counties)
Municipalities (15 Cities)

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VII. MISSISSIPPI SUPPLEMENT
WATER RESOURCE DEVELOPMENT SURVEY

A. Form Completion Instructions

This form is designed to provide information about water resource and related projects proposed in the 20-county Mississippi Appalachian Area. The 20 counties include:

Marshall	Tishomingo	Chickasaw
Benton	Union	Monroe
Tippah	Pontotoc	Webster
Alcorn	Lee	Clay
Prentiss	Itawamba	Choctaw
Oktibbeha	Lowndes	Winston
Noxubee	Kemper	

Each item of information can be completed by (1) Circling one or more appropriate letters or numbers or (2) By filling in information in the space provided.

Detailed Instructions:

Field
= C

Project Location

- A. State the name of the county in which the project is located (multi-county projects require separate forms for each county involved).
 - B. State the name of the municipality in which the project is located, or which is directly related to the project.
 - C.
 1. State the name of the stream on which the project is located, if appropriate.
 2. If the project is located on the upper reaches of the stream, circle No. 2.
 3. If the project is located on the lower reaches of the stream, circle No. 3.
 - D. State the river basin in which the project is located.
-
-

Detailed Instructions (Form A), Cont'd.

Field

= D Project Identification Agency

Identify your Agency by circling appropriate letter or numeral preceding the Agency or by filling in appropriate space provided.

Field

= E Water Resource Project Type

Circle letter or letters which most clearly identify the type of proposed project. For example, a proposed multi-purpose reservoir (E) may be designed for flood control (B), water supply (K), and recreation (M), in which case all would be circled.

Field

= F Project Description

- A. Limits refers to location, specifically the extent of the proposed project along a stream or river. Be as precise as possible.
1. State the location at which the project begins or ends downstream. This may be at the confluence with another river or near a town, highway or other landmark.
 2. State the location at which the project begins upstream. This may be at the origin of the stream or near a town, highway or other landmark.
- B. If the project is not located along a stream but rather is located at a specific point (example: sewage treatment plant) or in a specific area (example: municipal water distribution system), identify its location.

Describe the purpose and function of the project, the agency responsibility or interest in the project, progress toward completion of the project and other pertinent descriptive data.

- C. Identify the problem(s) which has prompted the proposed project such as past flooding, land damage, etc.

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Provide as much information as possible. It may be necessary to attach additional information to this survey.

- D. Explain justification for the project, results to be achieved, needs to be met, problems which would be alleviated.
- E. State the economic benefits, expected impact and return on investment which will result from the project. Provide available figures to illustrate benefits to be derived from the project.
- F. State the total cost of the project. Explain a breakdown of costs, if available.
- G. State each phase of development, its time schedule and cost.
- H.
 - 1. State the Federal agency (or agencies) which can fund the project, and its share of the total cost.
 - 2. Indicate the State agency (or agencies) which can fund the project, and its share of the total cost.
 - 3. Indicate the local agency (or agencies) which can fund the project, and its share of the total cost.
 - 4. State any agencies you feel can provide additional data or information concerning the project.

Field
= G

- A. State any water or related resources problem which you feel merits further study as a research project.
- B. Describe the research project you would envision and explain your reasons for selecting the project.
- C. State the agency or organization which would be capable of undertaking such a project.

Field
= H

Indicate additional information or personal comments you may have concerning the project. All information supplied in this survey will be held confidential; it will be released only in consolidated form with other surveys.

CONFIDENTIAL

ID #			
FORM #	0002306		
DATE	/	/	
	Month	Day	Year
(FOR MRDC USE ONLY)			

Field = C	<p><u>PROJECT LOCATION</u></p> <p>A. COUNTY () Name</p> <p>B. MUNICIPALITY () Name</p> <p>C. MAJOR STREAM 1. Name () (Circle One or More) 2. Upper Reaches 3. Lower Reaches 4. Both</p> <p>D. RIVER BASIN () Name</p>
Field = D	<p><u>PROJECT IDENTIFICATION AGENCY (Circle One)</u></p> <p>A. Mississippi Research & Development Center B. Tombigbee River Valley Water Management District C. U.S.D.A., Soil Conservation Service D. U.S.D.A., Other () Specify</p> <p>E. Tennessee Valley Authority F. Yellow Creek Watershed G. Bear Creek Watershed H. U.S. Geological Survey J. Mobile District, U.S. Army Corps of Engineers K. Vicksburg District, U.S. Army Corps of Engineers L. Memphis District, U.S. Army Corps of Engineers M. Nashville District, U.S. Army Corps of Engineers N. Mississippi Board of Water Commissioners P. County () Name</p> <p>Q. Municipality () Name</p> <p>R. North Mississippi Industrial Development Association</p>

Mississippi Research & Development Center

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Field = D (Cont'd.)	<div style="text-align: right;">ID # _____</div> S. Mississippi State University, Water Resource Development Institute T. Alabama Water Development Agency U. Tennessee Tombigbee Development Association V. Mississippi Park System W. Mississippi Forestry Commission X. Mississippi State Board of Health Y. Mississippi Highway Commission Z. Mississippi Game & Fish Commission 1. Mississippi Federal Program Coordinator, Office of the Governor 2. Mississippi Agricultural & Industrial Board 3. Mississippi Economic Council 4. Tennessee Water Development Agency 5. Farmers Home Administration 6. Other (_____) <div style="text-align: right;">Specify</div>																				
Field = E	<u>WATER RESOURCE PROJECT TYPE</u> (Circle One or More) <table border="0"> <tr> <td>A. Navigation</td> <td>L. Water Distribution System</td> </tr> <tr> <td>B. Flood Control</td> <td>M. Recreation</td> </tr> <tr> <td>C. Drainage</td> <td>N. Port Development</td> </tr> <tr> <td>D. Clearing and Snagging</td> <td>P. Wildlife Project</td> </tr> <tr> <td>E. Multi-Purpose Reservoir</td> <td>Q. Reclamation Project</td> </tr> <tr> <td>F. Water Quality Control</td> <td>R. Soil Conservation</td> </tr> <tr> <td>G. Water Pollution Abatement</td> <td>S. Channel Improvement</td> </tr> <tr> <td>H. Sewage Treatment Plant</td> <td>T. Research</td> </tr> <tr> <td>J. Sewage Collection</td> <td>U. Other (_____)</td> </tr> <tr> <td>K. Water Supply</td> <td></td> </tr> </table> <div style="text-align: right;">Specify</div>	A. Navigation	L. Water Distribution System	B. Flood Control	M. Recreation	C. Drainage	N. Port Development	D. Clearing and Snagging	P. Wildlife Project	E. Multi-Purpose Reservoir	Q. Reclamation Project	F. Water Quality Control	R. Soil Conservation	G. Water Pollution Abatement	S. Channel Improvement	H. Sewage Treatment Plant	T. Research	J. Sewage Collection	U. Other (_____)	K. Water Supply	
A. Navigation	L. Water Distribution System																				
B. Flood Control	M. Recreation																				
C. Drainage	N. Port Development																				
D. Clearing and Snagging	P. Wildlife Project																				
E. Multi-Purpose Reservoir	Q. Reclamation Project																				
F. Water Quality Control	R. Soil Conservation																				
G. Water Pollution Abatement	S. Channel Improvement																				
H. Sewage Treatment Plant	T. Research																				
J. Sewage Collection	U. Other (_____)																				
K. Water Supply																					
Field = F	<u>PROJECT DESCRIPTION</u> , Except Research A. Limits: 1. TO: (_____) <div style="text-align: right;">Specify</div> 2. FROM: (_____) <div style="text-align: right;">Specify</div>																				

Mississippi Research & Development Center

V-143-Miss

Field = F (Cont'd.)	ID # _____	
	B. Description:	
	(_____ _____ _____ _____)	
	C. Problem:	
	(_____ _____ _____ _____)	
	D. Justification or Need:	
	(_____ _____ _____ _____)	
	E. Economic Benefits:	
	(_____ _____ _____ _____)	
	F. Estimate of Cost, if Available:	
1. \$(_____)		
2. Explain: (_____ _____ _____)		
G. Phasing of Project:		
1A Phase 1 (_____)	1B Cost \$(_____)	
2A Phase 2 (_____)	2B Cost \$(_____)	
3A Phase 3 (_____)	3B Cost \$(_____)	
4A Phase 4 (_____)	4B Cost \$(_____)	

Mississippi Research & Development Center

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Field = F (Cont'd.)	<div style="text-align: right;">ID # _____</div> H. Funding Agency: 1. Federal: (_____) 2. State: (_____) 3. Local: (_____) 4. Agency which can provide additional information, if any: (_____) (_____) (_____)
Field = G	<u>RESEARCH PROJECT</u> A. Type of Study: (_____) (_____) B. Description: (_____) (_____) (_____) C. Recommended Study Group: (_____) (_____)
Field = H	<u>COMMENTS</u> (_____) _____ _____ _____

The Mississippi Research and Development Center sincerely appreciates your assistance in this important project affecting the development of Mississippi's water and related resources.

 Kenneth C. Wagner, Director
 Mississippi Research & Development Center

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DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENT

CHAPTER 6
NEW YORK WATER SUPPLEMENT

Prepared by
The Division of Water Resources, New York State
Conservation Department

1968

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Figure 9	Regional Board Studies	V-30 -NY
Figure 10	Growth Centers	V-36 -NY
Figure 11	Reservoir Sites	V-42 -NY
Table 1	Data on Reservoir Sites	V-43 -NY

PART 1. CONCLUSIONS AND RECOMMENDATIONS

The economic development of the Appalachian region lags considerably behind the national average. Although much has been done to improve economic conditions in the region, much more activity is needed to stimulate growth and to create a climate more favorable for private investment.

Water resources developments will provide a basic needed economic stimulus for the Appalachian region. Water resources developments will be required to help sustain increased economic activity in the growth centers whereas in other areas the removal of a flood hazard will permit more intensive land use. Elsewhere, water resources in combination with other developmental factors can provide a stimulus to induce private investment.

Changes in Federal and State laws and policies relating to cost sharing are needed to enable greater Federal financial participation in project development. These can aid materially in providing the water developments to provide the base for the economic stimulus needed for the region.

For the New York State portion of Appalachia, 27 potential reservoir sites were identified in a Statewide reconnaissance study and report completed by the State in 1966. (See Figure 11.) Since that time the Corps of Engineers has identified three additional potential sites warranting further study. These are the Cassadaga, Conewango and Stillwater sites located on Conewango Creek and tributaries in the Allegheny Basin. Immediate development of the most feasible sites would stimulate economic activity in the associated urban complexes which are economic growth centers. It is recommended that the Charlotte Creek, South Plymouth, Mud Creek and Stannard reservoir projects be funded by Congress for multipurpose development as soon as possible. New York State is in a position, through the Water Resources Commission, to guarantee the necessary local assurances for the non-Federal financial participation in recommended projects.

New York State recommends that the Federal government undertake preliminary studies of reservoir sites on Stillwater, Cassadaga, Conewango and Goose Creeks in the Allegheny Basin. A time-phased plan of development should be prepared for the most promising sites.

The Harbor of Refuge projects at Dunkirk and Lake Erie State Park recommended for development by the Corps of Engineers should be constructed as soon as funds can be made available.

The proposed Delhi local protection project in Delaware County should also be funded for construction immediately. New York State is willing to provide the necessary local assurances for non-Federal financial participation.

The river basins of the Appalachian Region can provide adequate water supplies required to sustain an expanding economy in the region, as well as provide future resources for the adjacent Eastern Seaboard and Great Lakes megalopolis.

Since there are relatively few prime reservoir sites in the eastern United States, New York recommends that all future dam and reservoir projects of both the Corps of Engineers and the U. S. Department of Agriculture (Soil Conservation Service) be developed to reasonably full hydrologic potential, and that Congress broaden its policy regarding reservoir storage for municipal and industrial water supply, recreational and irrigation storage to permit greater Federal participation in the cost-sharing aspects.

The State also recommends that alternatives to a proposed local protection project at Gowanda be considered. Accordingly, the Corps of Engineers should be provided funds to complete survey scope investigations on Cattaraugus Creek with emphasis on reservoir sites at Otto, Springville and a site on the main stem approximately six miles upstream from Gowanda.

New York State also recommends that the U. S. Department of Agriculture be given expanded authority in the Small Watershed Protection and Flood Prevention Program (PL 566) to permit investigations of reservoir storage for all purposes without regard to the availability of local sponsors for specific reservoir functions. Restrictions pertaining to the use of gated outlets and spillways in Soil Conservation Service's structures should be removed to allow multipurpose use and system-type regulation of small reservoirs as well as large ones. Because the administrative and legislative process is relatively slow, New York recommends that the Soil Conservation Service be provided additional monies now to undertake such studies in the following watersheds: (See Figure 1.)

1. Cayuga Inlet - Tompkins County
2. Mill Brook - Chenango County
3. Trout Brook - Cortland County
4. Great Valley and Little Valley - Cattaraugus County
5. West Branch Delaware River - Delaware County
6. Tioughnioga River
7. Chautauqua Lake/Chadakoin River - Chautauqua County

The Susquehanna River Basin Coordinating Committee Study (Federal-State) and regional water resources planning board studies (State-

local) will provide additional perspective and project recommendations. High priority projects resulting from studies such as the foregoing are being carried out throughout Appalachia as an integral part of the entire Appalachian program.

New York State recommends that construction of water development projects in the Appalachian Region be given the highest priority. Expansion of industry, agriculture and recreation are dependent on water resources development. Multipurpose reservoirs, coupled with other developmental factors, will provide an essential economic stimulus for the region and enhance its economic climate for future growth.

RECOMMENDED ACTIONS

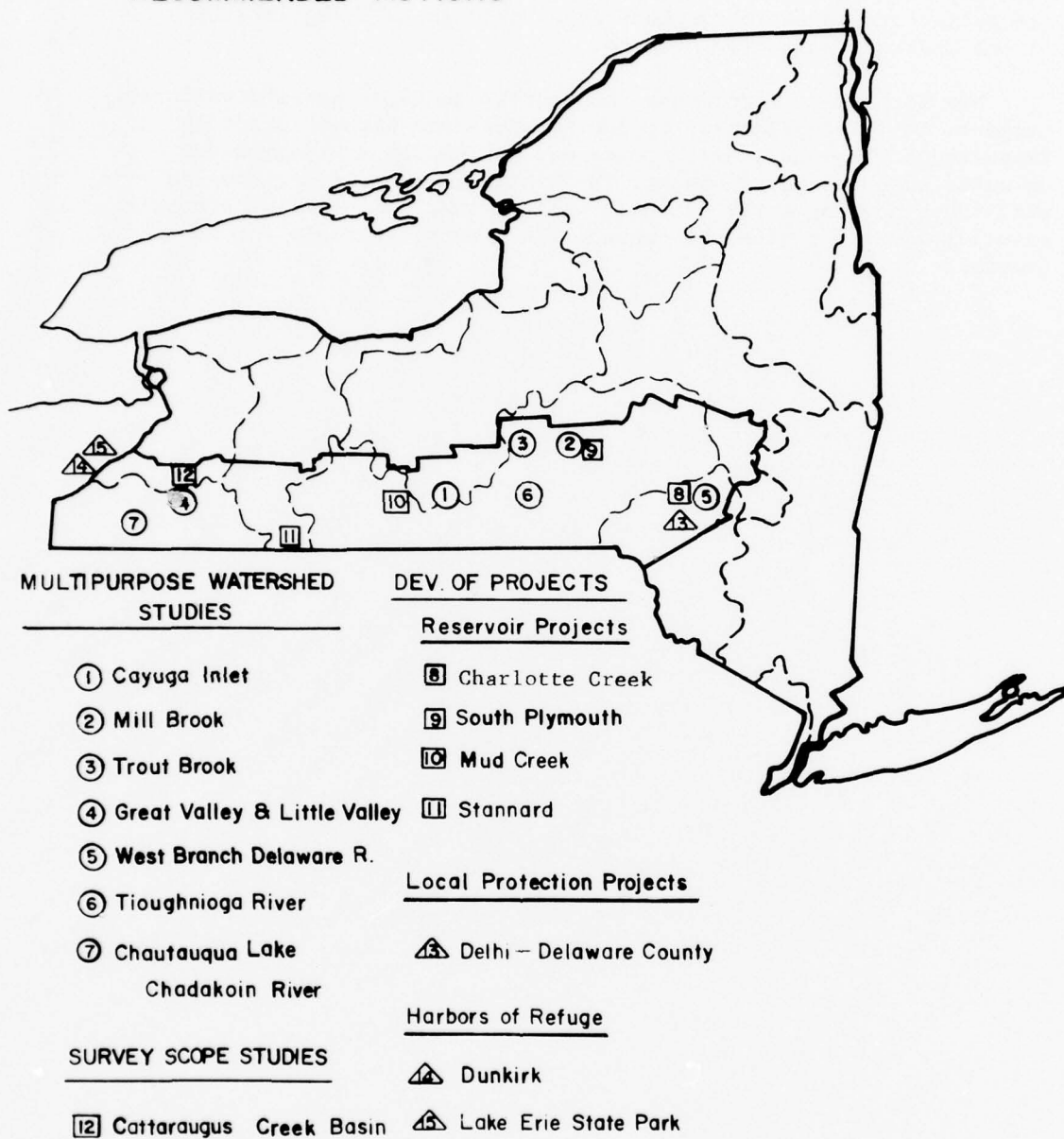


Figure 1

RECOMMENDED ACTIONS

MULTIPURPOSE WATERSHED STUDIES

1. Cayuga Inlet - Tompkins County
2. Mill Brook - Chenango County
3. Trout Brook - Cortland County
4. Great Valley and Little Valley - Cattaraugus County
5. West Branch Delaware River - Delaware County
6. Tioughnioga River
7. Chautauqua Lake/Chadakoin River

DEVELOPMENT OF PROJECTS

Reservoir Projects

8. Charlotte Creek
9. South Plymouth
10. Mud Creek
11. Stannard

Local Protection Projects

13. Delhi

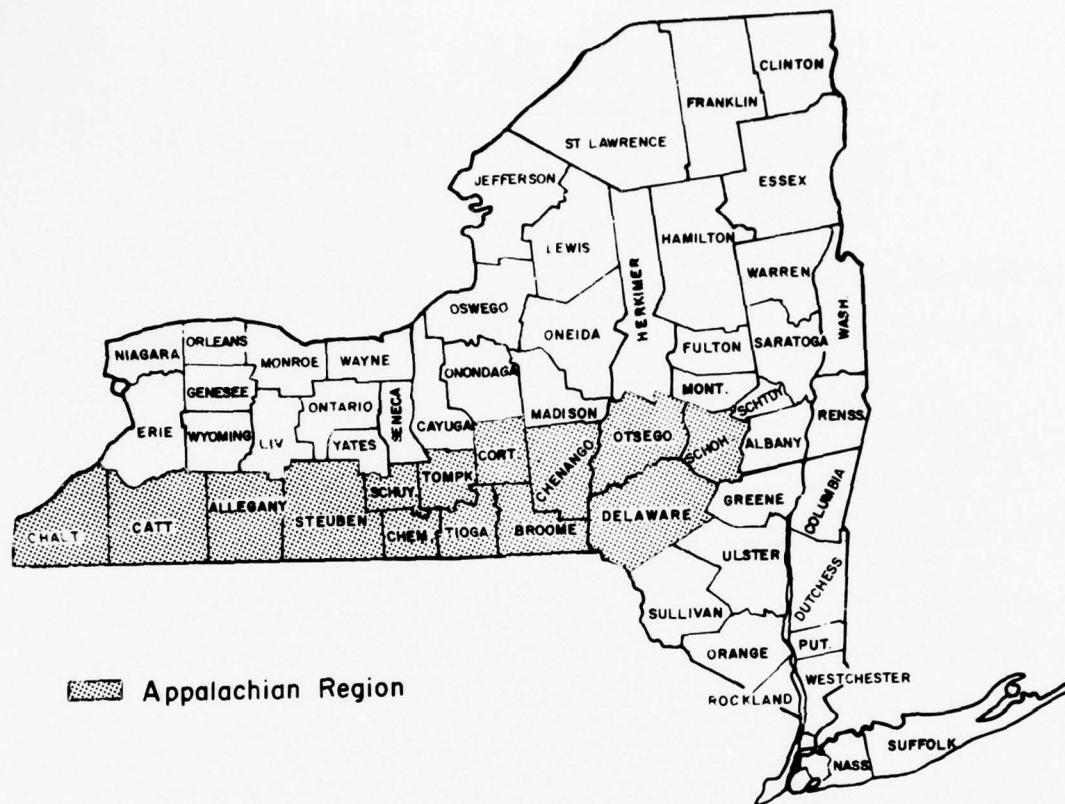
Harbor of Refuge

14. Dunkirk
15. Lake Erie State Park

SURVEY SCOPE STUDIES

12. Cattaraugus Creek Basin

Editors Note: A U.S. Army Corps of Engineers authorized project - Davenport Center Reservoir - is within Charlotte Creek Watershed, item 8, above.



NEW YORK COUNTIES IN APPALACHIA

Figure 2

V-6-NY

PART 2. INTRODUCTION

About 25 percent of the land area of New York State is included in the Appalachian Regional Development Program. The region consists of 14 counties in the Southern Tier, extending from Chautauqua County in the west to Schoharie County in the east. (See Figure 2.) About one million people live in this portion of New York, roughly six percent of the State's population.

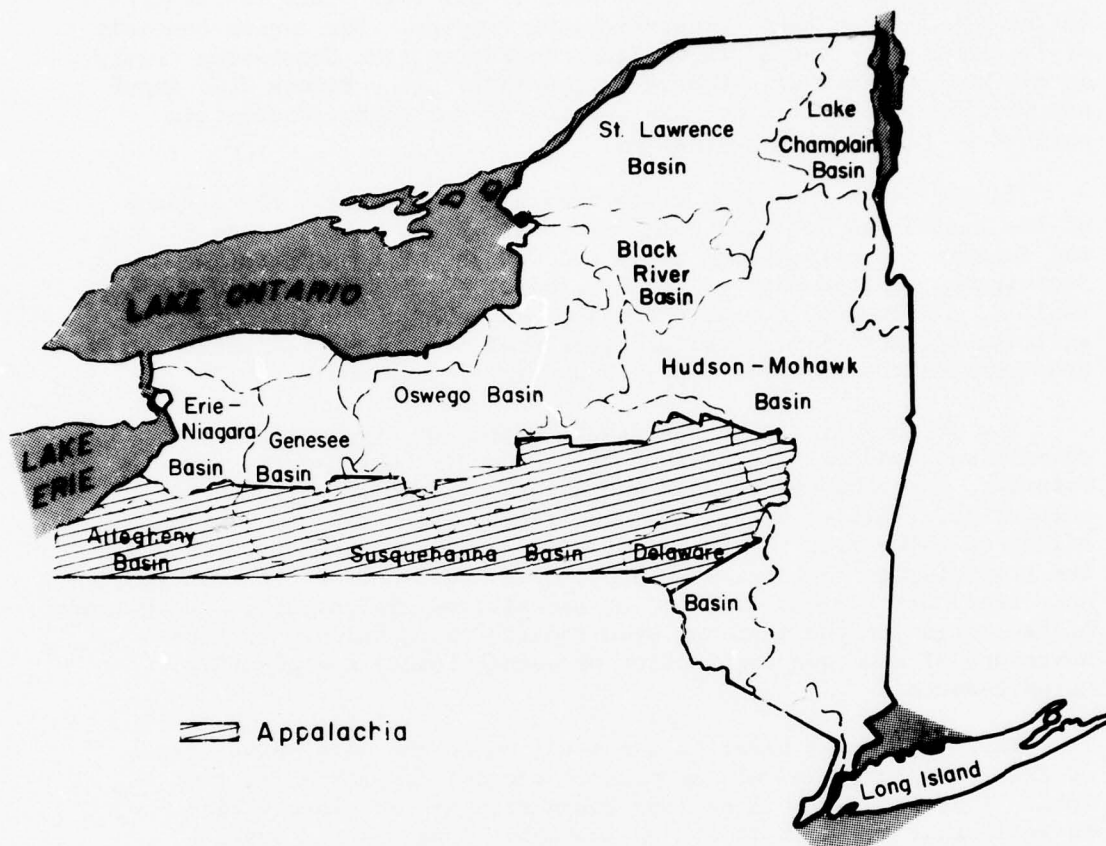
Except for a few urban centers such as Binghamton, the economy of the region has not kept pace with that of the nation. Among the reasons for this economic lag are inadequate transportation facilities, limited size of local markets, overly conservative venture capital, a decreased demand for unskilled labor and a decline in agricultural activity. Economic growth also has been inhibited by a combination of water supply and quality problems.

The 14 counties in the New York portion of Appalachia lie within seven river basins. (See Figure 3.) Four of these basins, the Delaware, Susquehanna, Genesee and Allegheny, extend beyond State boundaries. Despite relatively good average rainfall and availability of water from the area's streams and lakes, adequate storage and transmission facilities have not been constructed. In addition, many areas are subject to flooding and streams are polluted. Development of recreation in the area has been retarded by a failure to take advantage of a unique combination of scenic beauty and plentiful water resources.

Water resources planning and development can help solve many of these problems, as well as promote economic expansion in the area. Industry, agriculture and recreation are so closely tied to water that the improvement of available supplies and quality inevitably enhances economic growth potential.

If the Southern Tier is going to grow, adequate future water supplies for industry must be assured. Over long periods of time, population growth depends on employment opportunities. Long-range plans for stimulating future growth requirements are as important to management as the present availability of water. The future needs of the population, with increasing per capita water consumption and widening adoption of irrigation by farmers, also must be considered.

The Appalachian Program can make a significant contribution to the economy of southern New York and northern Pennsylvania. Physical improvements such as multipurpose reservoirs and massive highway construction programs--integrated with other developmental factors--can open the area to national markets by providing the



PRINCIPAL DRAINAGE BASINS OF NEW YORK

Figure 3

V-8-NY

water and transportation resources essential to industrial growth. The natural beauty of the Appalachian area, coupled with existing and planned recreational facilities, need only be made accessible to attract many more visitors.

If the natural and man-made resources of Appalachia are intelligently used and developed, unfavorable statistical trends for the region can be reversed.

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PART 3. WATER AND RELATED LAND
RESOURCES NEEDS

Many impediments to growth exist in the Appalachian region. Among them are inadequate transportation systems and unsatisfactory educational facilities, flooding potentials, shortage of manpower, shortage of municipal and industrial water supplies and lack of adequately developed recreation resources. The Appalachian Regional Development Act of 1965 authorized a Federal investment of nearly 1.2 billion dollars to provide needed assistance in developing the Appalachian area.

The Appalachian Act makes it possible to develop the region's resources and provide an atmosphere favorable for investment and growth. In New York State, a comprehensive plan of development for the State's portion of Appalachia is being developed by the Office of Planning Coordination. The water-related aspects of the plan are the responsibility of the Conservation Department's Division of Water Resources. The Division has identified present and projected water needs in the area and has evolved a preliminary plan for the development of projects that will satisfactorily meet some of the identifiable needs. Alternatives to be developed before the selection of a final plan will consider normalized growth, as well as developmental goals or benchmarks.

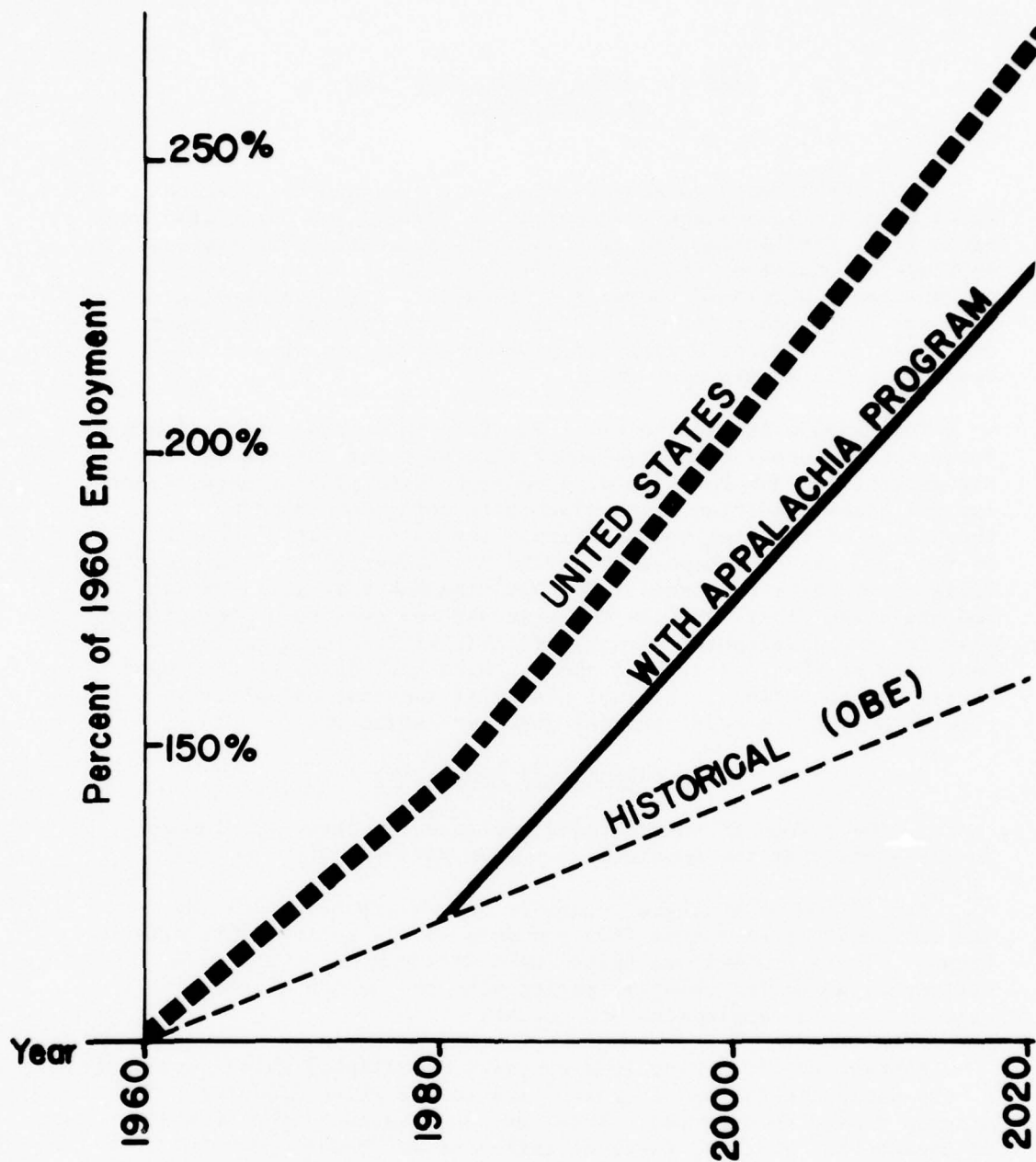
Developmental Benchmarks

If the trends of recent years continue, a virtual stalemate in the economy of the Appalachian region will result.

The Office of Business Economics has developed population and employment projections from analysis of the region's historical trends. These projections infer that unstimulated growth will not permit achieving relative parity with the nation's growth rate in terms of employment and income.

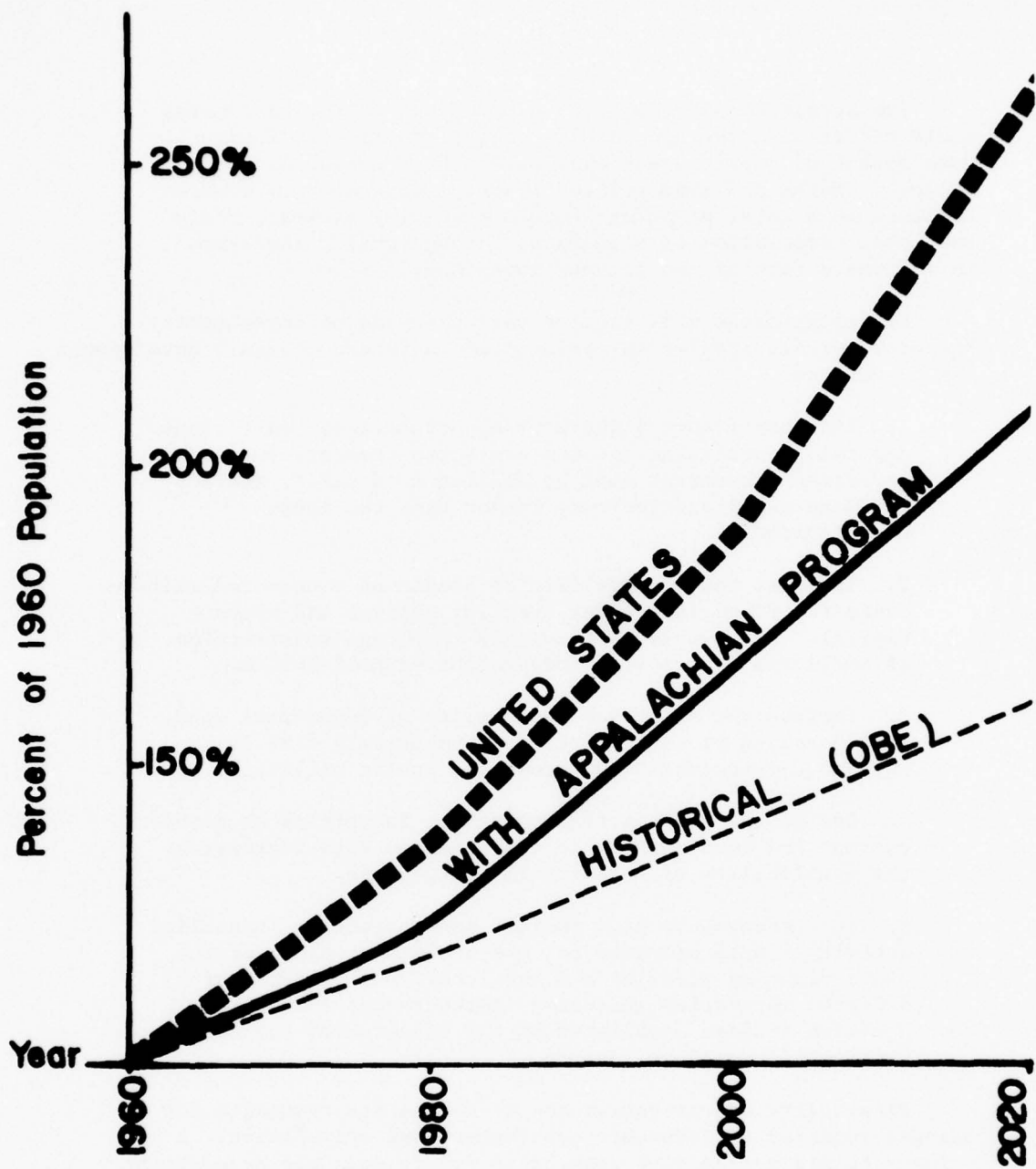
Another set of projections has been established which represents a more desirable degree of growth, and toward which planning efforts should be directed. These are designated by the Office of Appalachian Studies, Corps of Engineers as "Developmental Benchmarks." With stimulation, this accelerated growth may be achieved.

Figures 4 and 5 compare the rate of employment and population growth of the United States with the unstimulated normalized growth pattern and the benchmark growth pattern of Appalachia.



Comparison of Employment Growth

Figure 4



Comparison of Population Growth

Figure 5

The accelerated economic development which the benchmarks would confer upon the Appalachian region requires intensive development of growth areas that have a high probability of success. Water and land related resource developments must be combined in a total planning program involving Federal, State and local cooperation to stimulate, through public investment, an increased rate of new private investment.

Different areas will require various types of investments. However, certain development principles to future economic development may be defined:

1. Increase future investment opportunities. Sufficient capital is available for the projected economy, but some investment resources must be applied to diverse, smaller and more novel enterprises, rather than the large corporations.
2. Increase the availability of credit on a more competitive basis for fixed investment, working capital and venture capital. This would particularly encourage construction of small and medium size independent establishments.
3. Improve the selection and quality of industrial land. This pertains to large parcels of relatively flat land with good transportation access and public utilities.
4. Design and provide transportation facilities to serve current and future needs in coordination with increasing the availability of land for industrial use.
5. Use research to give insight into potential industrial activity. Data prepared for the investment plans of the State planning agencies and the locational criteria of selected industries indicated in the Fantus Industrial Location Studies (published by the Appalachian Regional Commission) would be included.

Flexibility and receptiveness to change are requisite for changes required for economic development and stimulation. A primary consideration with respect to future economic development is educational.

Water and related land resource planning and development for the region would stimulate economic growth by removing the detriments which can be attributed to water resources, as well as to enhance economic growth by strategic formulation of water resources projects. Specifically, diverse water resources needs should be met, and economic development opportunities should not be foregone due to the lack of water resources development.

Water Supply Needs

Public Water Supply

A sufficient supply of potable water to meet present and future needs is essential to the economic health of Appalachia.

Presently, over 80 percent of the urban population and 25 percent of the rural population of the New York portion of Appalachia is served by public water supply facilities. These facilities are expected to expand and serve nearly 90 percent of the urban area.

In 1960, the average use through public water supply systems was between 110 gallons per capita per day in rural areas and 145 gallons per capita per day in urban areas. By 2020, the estimated average usage, based on normalized growth, is expected to increase 150 percent.

In the Susquehanna River Basin, present urban use of 55 mgd is expected to increase to about 200 mgd; rural use is 16 mgd and expected to rise to 27 mgd by 2020. The Allegheny River Basin's present use of 16 mgd is expected to increase to 36 mgd.

Deficiencies in water supply are expected at Elmira around the year 1990. Without further source development, significant deficiencies will occur at both Elmira and Binghamton by 2000. In addition, smaller deficiencies will occur upstream from these two communities at Cortland, Sidney, Hamilton, Norwich, Hornell and Bath at about the same time.

Industrial Water Supply

Industrial needs are expected to increase more than 200 percent from 1960 to 2020. Some needs will be met through development of private supplies; others will be met on a contract basis with municipal systems. Availability of water is not the critical factor. Planning and construction of new facilities and expansion of existing ones will determine how well industrial water needs are met.

Groundwater

Great potential for groundwater development exists in many areas of Appalachia. There are unconsolidated sand and gravel deposits with a potential yield of between 100 and 1,000 or more gallons per minute in certain reaches of the Allegheny and Susquehanna Rivers.

This could be particularly important in counties such as Chautauqua, Cattaraugus, Chemung, Schuyler, Tompkins, Tioga, Cortland and Broome where economic potential is very high but good reservoir sites are limited. The development of wells for industrial and municipal water supply, where possible, could have a very favorable effect on residential and industrial growth.

Water Supply Studies

To plan for projects that will provide adequately for public water supply needs, the State is conducting intermunicipal public water supply studies in Appalachia as well as in the rest of the State.

As of January 15, 1968, studies had been completed for the following areas in the Appalachian portion of New York: Broome County; the towns of Collins, Persia and Perrysburg; and the villages of Gowanda and Perrysburg in Cattaraugus County. Studies are now underway on a county-by-county basis for the rest of the Appalachian Region of New York. (See Figure 6.)

Water Quality Management

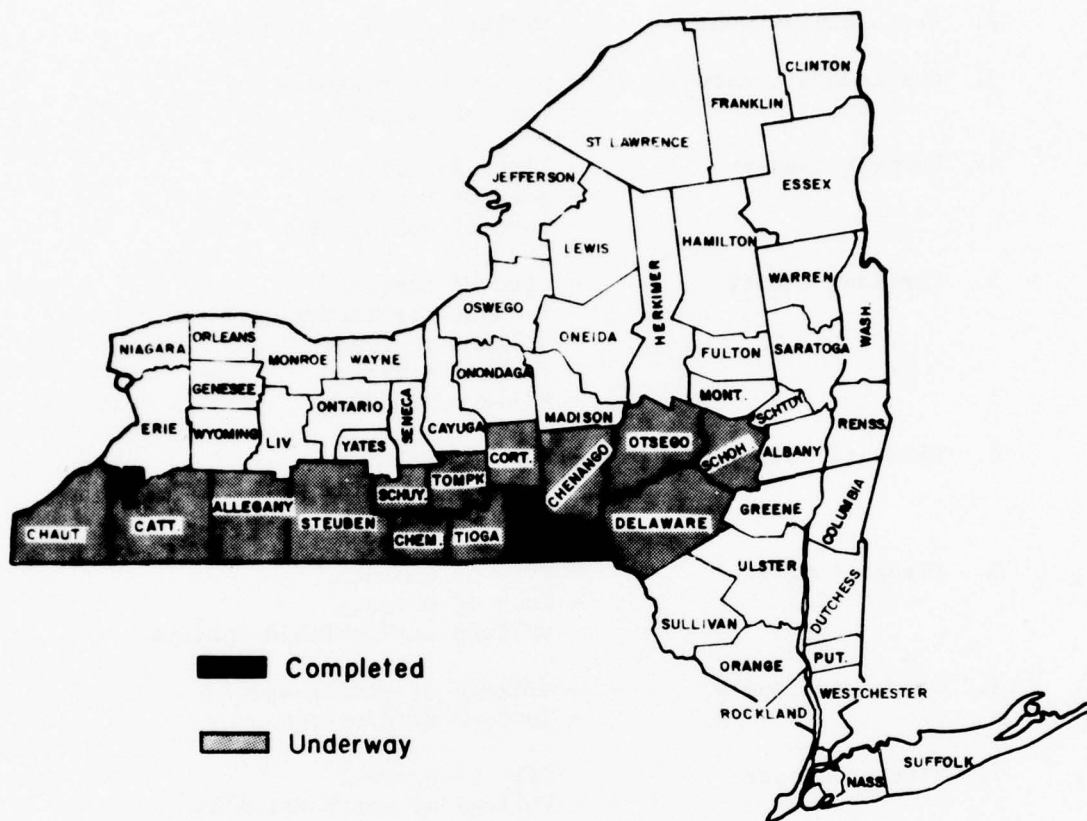
The preservation of adequate stream quality throughout the New York portion of Appalachia will depend largely on adequate waste treatment facility construction. Flow augmentation and advanced waste treatment are appraised as alternative means of managing water quality after secondary treatment facilities are considered. Water quality problems exist or are anticipated in six areas.

In the central part of the region, the Canisteo River in the Hornell-Canisteo area; the Chemung River in the Elmira area; the Tioughnioga River near Cortland and the Susquehanna River near Binghamton and Owego may require additional flows from groundwater to maintain a minimum dissolved oxygen content of 4 mg/l. Studies indicate that, with 85% removal of BOD and maintaining this minimum D.O., even releases from favorable potential reservoir sites would not be sufficient to maintain water quality standards without groundwater supplementation.

In the western part of the region, quality problems are expected from a proposed treatment plant in Bonita, Chautauqua County and from the existing Jamestown treatment plant.

Comprehensive Sewerage Studies

As part of the State's Pure Waters Program, comprehensive needs studies have been completed for the following areas of New York State covered by the Appalachia program:



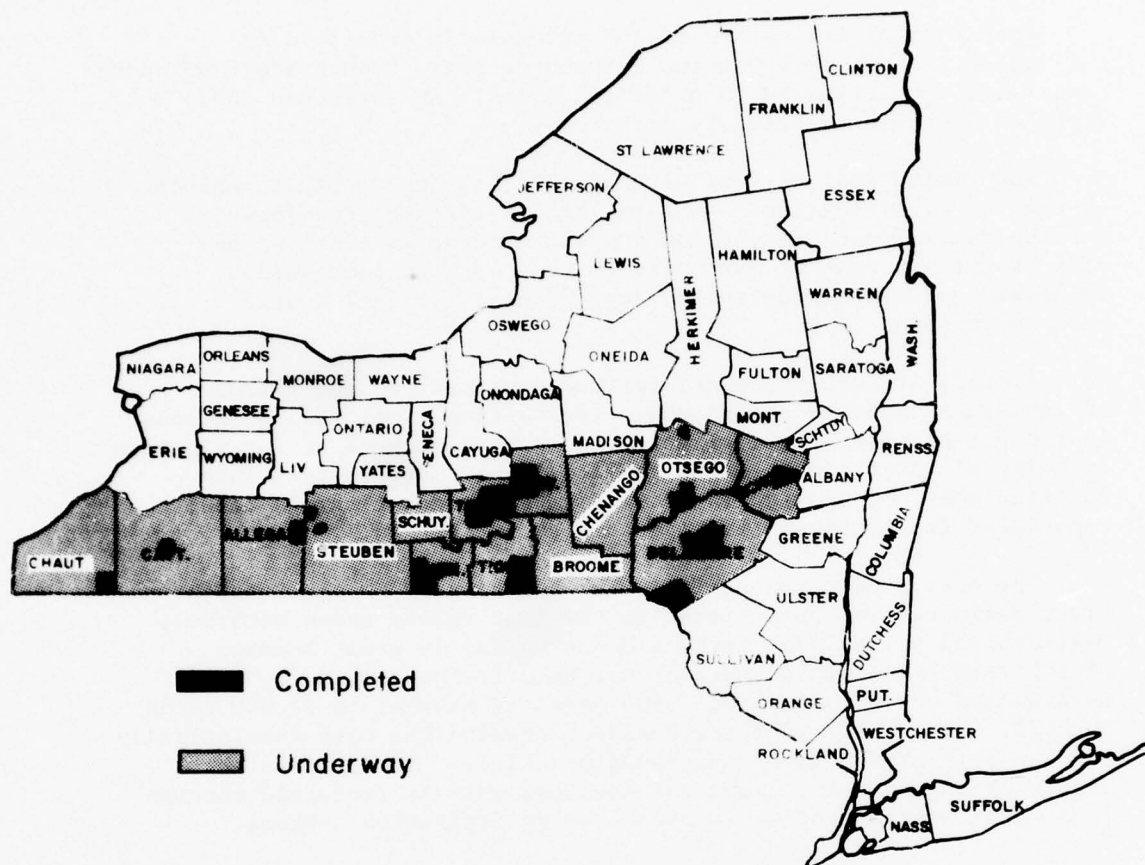
COMPREHENSIVE WATER SUPPLY STUDY

Figure 6

V-17-NY

- | | |
|-----------------------|--|
| 1. Broome County | - Countywide |
| 2. Cattaraugus County | - Village of Little Valley |
| 3. Chautauqua County | - County Sewer Agency
- Town of Carroll |
| 4. Chemung County | - City of Elmira
- Town of Big Flats
- Town of Southport |
| 5. Cortland County | - City of Cortland
- Town of Cortlandville
- Village of Homer
- Town of Homer
- Village of McGraw |
| 6. Delaware County | - Town of Delhi
- Village of Delhi
- Town of Hancock |
| 7. Otsego County | - City of Oneonta
- Town of Oneonta
- Village of Richfield Springs |
| 8. Schoharie County | - Village of Middleburgh
- Town of Middleburgh |
| 9. Steuben County | - City of Hornell
- Village of North Hornell
- Town of Almond
- Village of Almond
- Village of Arkport
- Village of Hornellsville
- Village of Woodridge |
| 10. Tioga County | - Town of Oswego |
| 11. Tompkins County | - City of Ithaca
- Town of Dryden
- Village of Dryden |

In addition, countywide studies are in progress for the rest of New York State within the Appalachian study areas. (See Figure 7.)



COMPREHENSIVE SEWERAGE STUDY

Figure 7

V-19-NY

Irrigation

Supplemental irrigation is not extensively practiced in the region. About 10,000 acres between Delaware County and Chautauqua County are now irrigated on a limited basis. An estimated 300,000 acres of land are potentially irrigable.

The rising cost of agricultural land has an important influence on the use of irrigation. As farm land is taken by developers for residential use, nearby lands will increase in cost and per acre production must be increased to keep up with land values. To attain optimum productivity, supplemental irrigation will have to be used.

To meet irrigation needs, optimum applications and methods of conveyance must be determined. In addition, serious limitations in the use of water for irrigation can result because of the riparian doctrine of water rights as it applies in New York State. This doctrine does not provide for use of water on non-riparian land, especially for a consumptive use such as irrigation.

The most productive agricultural activity is in the Susquehanna River Basin and is concentrated in the flat valley areas with deep well-drained soils. The irrigation potential is great because of the readily available surface waters. Irrigation in the basin is expected to increase from 6,500 acres at present to 37,000 acres in 2020. During the past few decades, erosion has been substantially reduced by improved land management practices. However, large tracts of unproductive, worn out land can only be reclaimed through land management practices supplemented by irrigation systems.

Supplemental irrigation is currently carried out on only about 430 acres in the Allegheny River Basin. Part of this irrigation is for frost protection. Crop production in this basin is severely limited by climate, soils and topography. Soils in the basin are generally poorly suited to agriculture and particularly to irrigated agriculture. About 77,000 acres of land appear suitable for irrigation. Total water requirement for present and projected future supplemental irrigation in the basin are well within the range of individual farm groundwater or surface water development and will not require consideration on a project basis.

A ten-mile strip along the Genesee River in the Wellsville area of Allegany County appears suitable for irrigation.

Rainfall in the agricultural areas averages about 32 inches annually, of which about 14 inches fall during the 120 to 165 day growing season.

Flood Control

Flooding is a problem in many portions of Appalachia. If the floods of 1935, 1936 and 1946 were to occur today in the Susquehanna Basin, estimated damages would be as high as \$125,000,000. Average annual damage that would result without any protection is estimated at about \$20,000,000. Through local improvement projects and flood control reservoirs, this has been reduced to about \$5,000,000. However, developments in flood plains continue to increase the amount of potential flood damages.

In the Allegheny Basin, flooding is local. The Soil Conservation Service is currently implementing a program in the Ischua Creek Watershed under Public Law 566. A similar program is under construction for the Conewango Creek Watershed. Total estimated damage reduction for both projects is expected to be about \$300,000 annually. The Corps of Engineers estimates primary annual flood damages of \$308,000 along the shores of Chautauqua Lake and the Chadakoin River.

In other areas of Appalachia, flooding is neither widespread nor of a large magnitude or frequency. Small watershed projects constructed under PL 566 with the technical guidance of the SCS generally can be expected to meet these needs.

To eliminate or reduce potential future flood losses, a program combining both structural and non-structural means is now being formulated, particularly in the Susquehanna Basin.

Flood Control Projects

The Conservation Department has overall responsibility for flood control activities in New York State: flood plain management; coordination of State, local and Federal activities leading to authorization and construction of flood control projects and furnishing assurances of local cooperation; administration; operation and maintenance of flood control projects throughout the State. Also, the Department is charged with the planning, design and supervision of construction of beach erosion control structures in coastal areas of the State.

Sixty-nine flood control facilities and all beach erosion and hurricane protection works are presently under the Department's jurisdiction. The total replacement cost of these flood control projects in New York State is about three-quarters of a billion dollars at today's prices.

Two-thirds of the 69 flood facilities are located in the flood-prone Allegheny and Susquehanna River Basins. Additional flood

control facilities under way or planned in the New York counties of Appalachia are shown on Figure 8.

Recreation

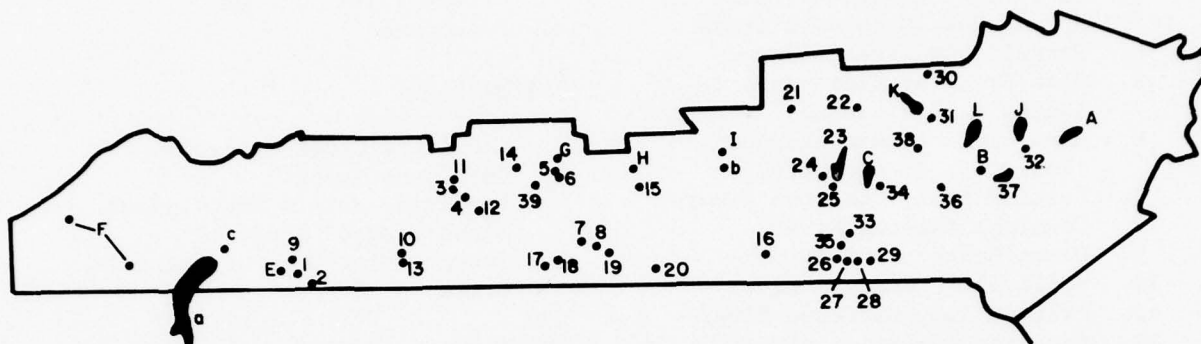
One of the most important future water uses is recreation. Increased leisure time, shorter work weeks, growing incomes and the popularity of water-based recreation will necessitate increased water surface area. New York State government has been given an excellent opportunity by the voters to develop the State's outdoor recreation resources by passing two bond issues for land acquisition and development totaling 300 million dollars. Planning to develop these resources should proceed now so that areas possessing potential for outdoor recreation can be designated for future development. Unless action is taken now to plan for future use, the prime outdoor recreation areas may be usurped by other conflicting types of development.

Susquehanna River Basin. In the growing urban areas of the south central part of the basin, additional water-oriented recreational facilities are needed to provide capability for swimming, boating, camping and picnicking. The densely populated urban areas to the north and east of the basin also will be attracted to recreational facilities. Particularly needed are streams and other bodies of water suited for multipurpose use. Additional highway developments now planned will provide improved access to the entire area from the megalopolis to the east.

Schuyler and Otsego Counties have adequate water surface area to meet their local recreational needs; whereas, Chemung, Broome and Tioga Counties do not have sufficient lake area to meet present or projected recreational needs. Half of the population of this area is at least 20 miles from a major body of water and 30% is located at a distance greater than 30 miles. Recent estimates of demand for boating activities indicate that there is a minimum present need for development of 7,000 acres of water surface, most of which is directly related to the urbanized Binghamton area.

Four major park areas are needed at locations convenient to the urban areas with boating, camping and picnicking facilities available for "day use." One is located west of Oneonta on the Otego Creek; another on the Otselic River north of Binghamton; the third north of Owego on the west branch of Owego Creek; and the fourth north of Corning along Meads Creek. Additional reservoirs throughout the Basin could be used for water-oriented recreation.

Twenty potential reservoir sites have been identified for this basin. (See Figure 11.)



1 - 39 COMPLETED
 a - c UNDERWAY
 A - C NOT STARTED
 E - L INACTIVE

FLOOD CONTROL ACTIVITIES IN APPALACHIA

Figure 8

V-23-NY

Flood Control Projects

Completed:

1. Olean, Allegheny River
2. Portville, Allegheny River
3. Almond Dam, Canacadea Creek
4. Hornell, Canisteo River
5. Glen Brook at Hammondsport
(Snagging & Clearing)
6. Glen Brook at Hammondsport
(Emerg. F. C. Activity)
7. Painted Post, Cohocton River
8. Corning, Chemung River
9. Olean Creek at Olean
10. Wellsville, Genesee River
11. Arkport Dam, Canisteo River
12. Canisteo, Canisteo River
13. Wellsville, Genesee River &
Dyke Creek (Snagging & Clearing)
14. Avoca, Cohocton River
15. Montour Falls
16. Owego Creek at Owego
17. Tuscarora Creek at Addison
18. Addison, Canisteo River
19. Corning, Chemung River
20. Elmira, Chemung River
21. Cortland, Tioughnioga River
22. Otselic River at Cincinnatus
23. Whitney Point Dam
24. Lisle, Tioughnioga River
25. Whitney Point Village,
Tioughnioga River
26. Endicott, Johnson City at
Vestal (Emer. F. C. Activity)
27. Endicott, Johnson City and
Vestal, Susquehanna River
28. Binghamton, Susquehanna River
29. N. Branch Susquehanna River at
Conklin and Kirkwood
30. Chenango River at Sherburne
31. Chenango River at Norwich
32. Susquehanna River at Oneonta
33. Chenango River at Port Dickinson
34. Birdsall Creek at Greene
35. Chenango River at Binghamton
36. Newtown Creek at Bainbridge
37. East Sidney Dam, Ouleout Creek
38. Oxford, Chenango River
39. Bath, Steuben County

Underway:

- a. Allegheny Reservoir
- b. Cayuga Inlet, Ithaca
- c. Salamanca

Not Started:

- A. Charlotte Creek Reservoir,
Charlotte Creek
- B. Unadilla, Martin Brook (Small
flood control project)
- C. Genegantslet Dam, Genegantslet
Creek

Inactive:

- E. Allegany, Allegheny River
- F. Lake Chautauqua and Chadakoin
River
- G. Hammondsport, Oswego River Basin
- H. Watkins Glen
- I. Ithaca, Cascadilla and Fall Creek
- J. West Oneonta Reservoir
- K. South Plymouth Reservoir
- L. Copes Corners Reservoir

Allegheny River Basin. Recreational deficiencies now are not as great here as in other areas. The Allegheny River, Cuba and Chautauqua Lakes and the Chadakoin River are excellent areas for water-based recreation. In addition, the Allegheny Reservoir with 12,000 acres of surface should enhance the recreational opportunities. Most of the present demand is generated locally. However, some is due to the Erie-Niagara area and Rochester. Expansion of county parks should receive top priority in overall recreational coordination and programming. These parks should be located as near as possible to the urban areas and consideration should be given to day-use facilities. Completion of the Southern Tier Expressway (Route #17) and planned north-south expressways connecting to the urban area of Rochester to the north and urban areas in Pennsylvania to the south will broaden the recreational market, greatly increasing the water-based recreational demand. Additional facilities must be planned now to meet the future increased demand expected.

Natural scenic areas of the basin should be examined for potential for further development such as the Chautauqua gorge on Chautauqua Creek located north of Mayville in Chautauqua County. The development of scenic auto routes, trails and campsites, if feasible, would make the scenic gorge accessible and more attractive to many travelers.

Delaware River Basin. In the eastern part of the region, the New York City area generates the most demand on recreational facilities. These demands are met mostly by private facilities. In addition, these facilities for the most part do not utilize to any great extent the available natural recreational resources. However, with the completion of route #17 in and through the area, a substantial increase in recreational demand from New York City can be expected in the near future. Few public areas exist in the region; additional facilities must be developed to meet future demands.

Recreation Plans

The major functional responsibility for the State's interests in recreation lies in the New York State Conservation Department and the State Council of Parks. The Department's Division of Parks maintains primary recreation responsibility in the Conservation Department, while other Divisions such as the Division of Fish and Game, the Division of Water Resources and the Division of Motor Boats provide major contributions in planning and implementation of recreation developments. The State Council of Parks has broad powers in such areas as: the establishment of statewide park planning programs, determination of operational procedures, coordinating and consolidation of programs, and cooperation with local governments.

Other agencies at both the State and local level of government and private enterprise as well have contributed and will continue to contribute to the overall capability of the State to meet its present and future outdoor recreation demand.

To provide a balanced and responsive program for future needs, a Statewide Comprehensive Outdoor Recreation Plan has been prepared. The plan recognizes interests and capabilities at all levels of government and proposes a development plan which fuses these elements into a framework for future and on-going action. As a necessary and logical complement to the Statewide Comprehensive Outdoor Recreation Plan (SCORP), further measures are now being taken by the Conservation Department to develop and provide a continuous planning process method which will relate the public and private entities that contribute to State outdoor recreation development.

State Parks

Key responsibility for outdoor recreation developments in Appalachia lies with the Regional State Park Commission.

There are 12 State parks in the New York portion of Appalachia at present under the jurisdiction of Regional Park Commissions. The Conservation Department also maintains 11 boat launching and access sites in the area. Specific plans have been developed for meeting future recreation demands in each park region. On-going programs include land acquisition and facilities development, in line with the State plan for outdoor recreation.

Reservoirs. Of special significance in future outdoor recreation facilities are multipurpose reservoirs to provide recreational opportunities as well as functions such as flood control and public water supply. Some 11 sites in the Appalachia counties show promise for development of impoundments suitable for recreational use. (See Table 1.) Further studies will be made to assess feasibility of these sites.

Fish and Wildlife

Fish and wildlife exist abundantly throughout the 14 county area. Use of natural lakes for water supply, flood control and stream flow augmentation will tend to reduce their value as wildlife habitat, unless water-level variations are limited sufficiently to preserve feeding grounds and otherwise reduce the impact upon wildlife.

Lakes and reservoirs must be managed to both enhance fish and wildlife and to reduce the impact on fish and wildlife in multipurpose endeavors.

Improving fish and wildlife habitat and providing public access to good fishing streams, lakes and ponds is a continuing program of the State Conservation Department's Division of Fish and Game. An average of \$75,000 to \$100,000 is spent annually for public access and stream improvements in 12 of the New York State counties in Appalachia, where perpetual fishing rights for public access are now held on some 283 miles of streams.

Five-year projections for wildlife marsh construction show that 10 acres per year in each of the 14 counties are planned at an annual cost of about \$35,000.

PART 4. WATER RESOURCES PLANNING PROGRAMS

The New York State Water Resources Commission has primary responsibility for policy and planning concerning the water and related land resources of New York State.

The Commission is composed of seven members with the Commissioner of Conservation as Chairman. Other Commission members are the Attorney General and the Commissioners of Transportation, Commerce, Health, Agriculture and Markets and the Office for Local Government. Four lay advisory members appointed by the Governor represent industry, political subdivisions, agricultural interests and sportsmen.

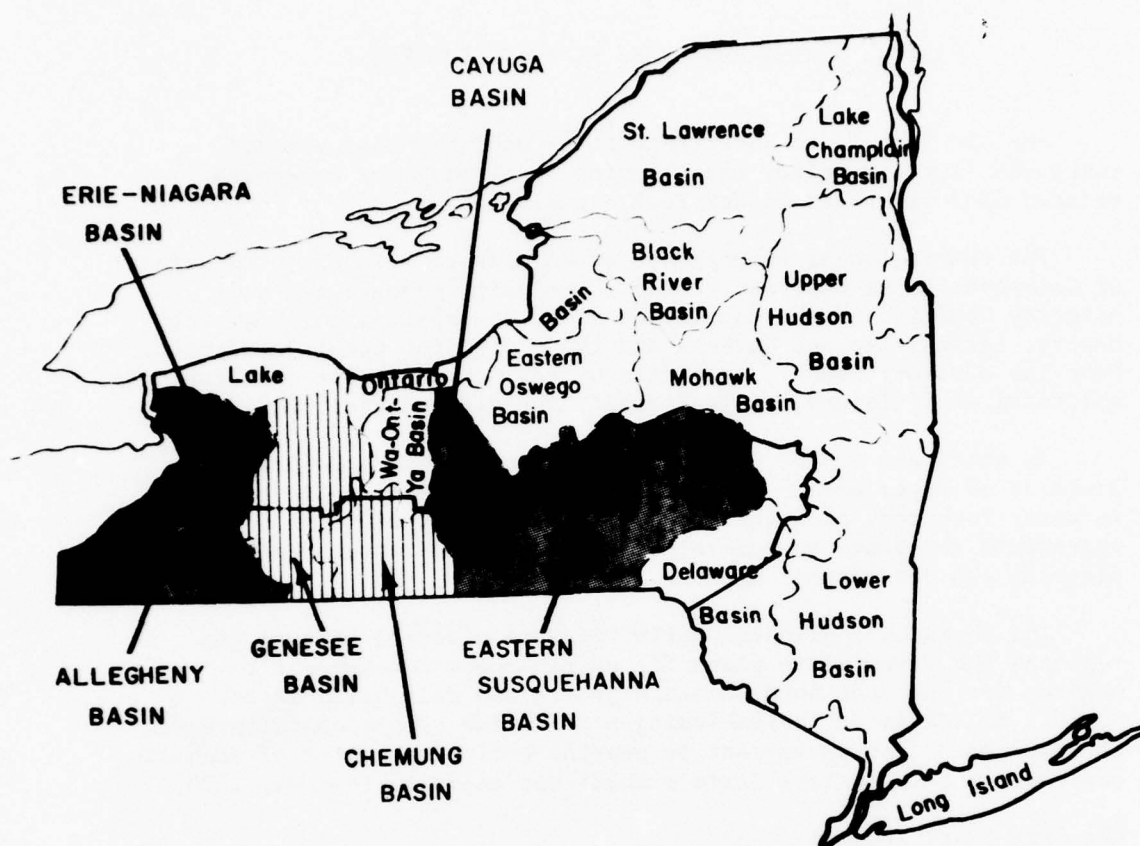
As staff arm of the Commission, the Conservation Department's Division of Water Resources coordinates State agency activities in water resources planning and development. The Division also represents the State in Federal-State coordinated water resources planning and development studies.

The Division's planning activities are directed at evolving regional and river basin plans for multipurpose development to provide for the continued economic growth and well-being of the State. The Division is fashioning a Statewide comprehensive program of development and management to provide sufficient water of adequate quality for all New York State's multi-use needs to the year 2020.

Regional Board Studies

Comprehensive water resources planning at the State and local level in New York is conducted through Regional Water Resources Planning Boards. Regional boards, composed of seven local representatives, are established by local initiative. Each Board is responsible for evolving a comprehensive plan of development of its region's water resources (similar in scope to Federal Type II Comprehensive River Basin Planning). Seventy-five percent of the study's total cost in each board region is borne by the State and the remainder by the participating counties. Staff services to regional boards are provided by the Division of Water Resources. The following individual regional board studies are within that portion of New York State covered by the Appalachia program. (See Figure 9.)

ERIE-NIAGARA BASIN. This board was the first to be established in the State on January 15, 1963. The participating counties include Erie, Genesee, Wyoming and Cattaraugus (the last being the only one of the four counties within the Appalachian region). A comprehensive water resources development plan for this basin is being finalized



REGIONAL BOARD STUDIES

■ Active

▨ In Formation

Figure 9

V-30-NY

with a target date of June 1969. The Cattaraugus Creek reservoir site discussed later is being studied in conjunction with this regional board study.

ALLEGHENY BASIN. A board was established in this basin on August 30, 1967. Three counties in Appalachia (Chautauqua, Cattaraugus and Allegany) are involved. The State has participated in the framework studies for this basin as a member of the Ohio River Basin Coordinating Committee (Federal Type I Study). The regional board is in the process of expanding the information developed during this framework study in an effort to develop a comprehensive plan for the New York State portion of the Allegheny Basin in 1971.

GENESEE BASIN. Only one (Allegany) county in this river basin is within Appalachia. Applications have been received and a regional board should be established and become actively involved in a study of this basin within the next six months. Due to time and funding limitations, the Federal-State Coordinating Committee could not complete its investigations of the Genesee River Basin on a comprehensive basis. The regional board study will supplement the Committee study with the objective of developing alternatives and ultimately a comprehensive basin plan by 1972.

CAYUGA LAKE BASIN. The counties of Cayuga, Seneca and Tompkins are participants on a regional board which was established on November 1, 1964. Tompkins County is the only county of these three that is a part of Appalachia. The Board is one of three in the Oswego River Basin working in a coordinated State effort to establish a comprehensive development plan for the basin by 1971.

CHEMUNG BASIN. The counties of Steuben, Schuyler and Chemung will participate on a regional board to be established in October 1968. The Chemung River Basin, a major headwater area within the Susquehanna River Basin, is being studied by the Susquehanna River Basin Coordinating Committee (Federal-State). The final report of this study is scheduled for completion in 1970. The State of New York has been an active partner in this effort and a significant amount of information will be available for the various tasks to be undertaken by the board (similar to tasks described under Eastern Susquehanna below). A tentative date of June 1972 has been established for completion of the comprehensive plan by the regional board.

EASTERN SUSQUEHANNA BASIN. Seven counties are represented on a regional board which was established in May 1967. The counties of Broome, Chenango, Cortland, Delaware, Otsego and Tioga are all part of the Appalachian region. This basin is also being studied by the Susquehanna River Basin Coordinating Committee as noted under the Chemung Basin summary. In addition to the Coordinating

Committee study, a Resource Conservation and Development project has recently been completed under the sponsorship of the U. S. Department of Agriculture. This is a local action program and is helpful in indicating problems for which comprehensive regional planning is needed.

A State study to supplement the economic and engineering investigations of the Coordinating Committee studies is also being made. It will include:

1. The comparative appraisals of various means of multipurpose water resources development and management in the Eastern Susquehanna River Basin of New York State which are either alternative to or supplementary to those under consideration in the Coordinating Committee studies.

2. The investigation of the possibilities for multipurpose water resources development in the Charlotte Creek Basin by making comparative appraisals of the Charlotte Creek Development, upland storage and other structural alternatives.

Present and projected gross demands and net demands (needs) for water resources which have been made by the Coordinating Committee studies will be appraised. These include flood control, water supply, water quality management, outdoor recreation, fish and wildlife enhancement and preservation, irrigation, hydropower and other related purposes.

The objectives of water resources projects and systems to be considered in these studies include:

- a. National economic efficiency;
- b. Regional economic development;
- c. Quality of the environment.

Direct benefits will be developed using standard procedures. Calculation of indirect costs and benefits and expansion benefits will follow generally the methods used in the Appalachia studies.

For the Charlotte Creek Basin and immediate or short-range (to 1985) development requirements, intangible factors will be evaluated qualitatively to demonstrate their significance. Methods to mitigate losses and to provide for the enhancement of tangible benefits will be investigated.

The study will identify and compare alternative projects and/or systems for the Charlotte Creek Basin and the Eastern Susquehanna Basin which would meet the short-range (to 1985) water resources requirements and indicate those projects and/or systems needed

on a long-range (1985 to 2020) basis.

A preliminary draft for the Charlotte Creek Basin will be completed September 1, 1968. A draft report for the Eastern Susquehanna River Basin, including incorporation of the Charlotte Creek Report will be completed by December 31, 1968. A final report will be ready April 1, 1969.

An economic impact study of the Charlotte Creek Reservoir is also underway.

Additional studies required in the Eastern Susquehanna Basin will be made in the course of the regional board study. A regional board also is now being formed in the Western Susquehanna. It will conduct a study to complement that of the Eastern Susquehanna and the development of a basin plan for the entire New York State portion of the Susquehanna River Basin will be completed in July 1972.

State-Federal Studies

A number of studies are being conducted jointly by interstate or joint Federal-State commissions or committees. An important State objective of these studies is to insure that cooperatively-devised projects will meet all major needs of New York State.

In addition to a Coordinating Committee study of Appalachia, other joint studies in which New York State is a participant include the following:

Genesee River Basin. This is a Coordinating Committee study which involves the states of New York, Pennsylvania and Federal agencies. This study was initiated early in 1963 and the staff of the Division of Water Resources has contributed to certain phases of the study. The final report is scheduled for completion in 1968.

Susquehanna River Basin. The study is being conducted under a Coordinating Committee, involving the State of New York, Pennsylvania and Maryland and Federal agencies. An interstate compact to provide for management and implementation of the developing comprehensive plan has been drafted. This compact has received the approval of the legislatures of New York and Maryland. The study was initiated in June 1963 and, here again, the Division of Water Resources is an active participant. A final report is scheduled for completion in 1970.

Delaware River Basin. The planning, development and management of the water and associated land resources of this basin are under

the Delaware River Basin Commission. The Division of Water Resources provides technical data and evaluations to the Delaware River Basin Commission staff and acts as liaison for the New York agency participation.

Ohio River Basin. This is a framework study by a Coordinating Committee including 11 states and numerous Federal agencies. The area in New York includes parts of Chautauqua, Cattaraugus and Allegany Counties in the Allegheny Basin. This study was initiated in September 1963 and New York State began to participate actively in the study in mid-1964. A final report is scheduled for completion by July 1968.

Great Lakes Basin. This study is being conducted by a Commission created under Title II of the Federal Water Resources Planning Act of 1965. This study was initiated in late 1967. As a framework study initially, this program will eventually evolve into a detailed comprehensive study of the basin. The framework study is scheduled for completion by July 1971.

Hudson-Mohawk-Champlain Intercoastal Metropolitan Area. The Federal Water Pollution Control Agency has been authorized to conduct a comprehensive water pollution control study which will take seven years and cost \$12 million to complete. This study also embraces the tri-state area centered around New York City.

North Atlantic Regional Framework Study. This study, involving 13 states, the District of Columbia and five Federal agencies with the North Atlantic Division Corps of Engineers serving as chairman of the Coordinating Committee, was initiated in January 1966. A plan of study has been evolved calling for completion of the study by July 1970.

Northeastern U. S. Water Supply Study. The Rivers and Harbors Act of 1965 authorizes the Corps of Engineers in cooperation with appropriate Federal, State and local agencies to undertake a comprehensive study of means to provide for the long-range water needs of the Northeastern United States.

Studies for Office of Planning Coordination

The Division of Water Resources performs the water resources aspects of planning for the State's central long-range planning agency, the Office of Planning Coordination (OPC). A Water Resource Development Strategy for the Appalachia portion of New York State (Southern Tier) is being developed by the Division of Water Resources. The study is expected to be completed by July 1, 1969.

PART 5. GROWTH CENTERS AND WATER RESOURCES DEVELOPMENT

The Office of Planning Coordination has identified 14 urban complexes in the Appalachian region as economic growth centers. (See Figure 10.) Generally these include one or more cities and its environs. They are not limited by political subdivisions and usually follow river valleys or corridors of transportation.

The State Department of Transportation has proposed developing a corridor highway system consisting of some 600 miles of high-speed controlled access roads to link the area with metropolitan centers of the State, the midwest, the eastern seaboard and New England. These highways will allow rapid movement of goods, services and labor to manufacturing centers, raw materials to processing and fabrication points, and finished products to markets. Connections between the New York and Pennsylvania corridor highways will permit Pennsylvania to enjoy direct access routes to Boston and other market centers of New England.

The 14 economic growth centers will be greatly enhanced by water resources, particularly development of reservoir sites. Twenty-seven potential reservoir sites have been identified for the New York portion of Appalachia. (See Table 1.) Development of these sites would stimulate economic activity in these growth centers.

Cobleskill-Schoharie Growth Center lies in northern Schoharie County. The 1960 residential population was more than 12,000 people, less than 600 of whom work in the area.

The proposed Fort Hunter reservoir site on the Schoharie Creek is some 10 miles north of the growth center and 2½ miles from the Mohawk River. A recreation area on the east shore would give a view of the entire lake and would be a major attraction to the Cobleskill-Schoharie area.

Susquehanna Valley Growth Center runs along the valley of the Susquehanna River in Otsego and Delaware Counties and cuts across the southeasterly corner of Chenango County. The 1960 population of the area was over 35,000. A total of 7,200 persons are employed by the diverse industries in the center.

An economic impact study of the Charlotte Creek Reservoir project is scheduled for completion in late 1968. The proposed reservoir on Charlotte Creek could add 2,850 acres of water surface and as much as 127,000 acre-feet of storage for multiple use in the Susquehanna Valley. In addition, proposed sites on Otego Creek and Wilkins Brook would provide a total of 89,000 acre-feet of storage and well over 1,000 surface acres.

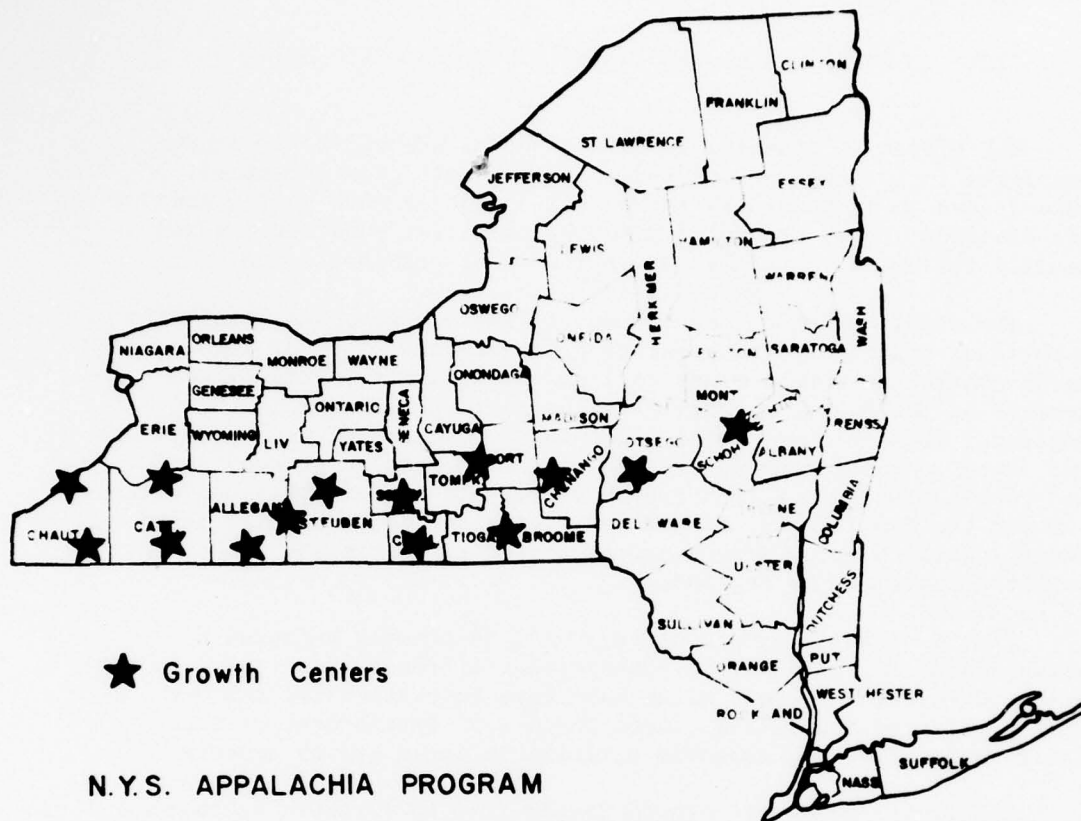


Figure 10

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The most urgent need at present is for flood protection to reduce flood damages which are inhibiting the area's economic growth.

Chenango Valley Growth Center is located in Chenango County and roughly follows the Chenango River from north of Sherburne to Greene. The population in 1960 was nearly 27,000 with 5,400 people employed by manufacturing plants in the valley.

One reservoir recommended for construction is located in the Chenango Valley almost within this center: The South Plymouth site on Canasawacta Creek.

Binghamton-Owego-Susquehanna Growth Center and the Chemung River Valley Growth Center are located near the southern boundary of New York State and includes Corbettsville, Binghamton, Johnson City, Endicott and Owego on the Susquehanna River and Waverly, Elmira, Corning, Addison and Horseheads on the Chemung, Cohocton and Canisteo Rivers. Together, the 1960 population was 340,000 with the industries in the area providing over 80,000 jobs to residents both in and around the centers.

One initial stage reservoir site is proposed near this growth center on Mud Creek, north of the village of Savona. Also, two promising sites have been noted; one on Meads Creek and the other on Owego Creek. Together these would store about 120,000 acre-feet of water with a total surface area of over 5,000 acres. These reservoirs would provide benefits for recreation, fish and wildlife, flood control, water supply and water quality control.

Additional economic benefits to these two growth centers would be from development of the proposed upstream sites such as Charlotte Creek, Five Mile Creek and South Plymouth. The flood prevention features of these impoundments added to the benefits from the Mud Creek reservoir would reduce the inhibiting factor of flood damage to the point that the areas would become greatly attractive to industry.

Ithaca-Cortland Growth Center and Watkins Glen-Montour Falls Growth Center are located at and near the southern ends of Cayuga and Seneca Lakes. The Ithaca-Cortland center extends eastward from Ithaca to the city of Cortland. The combined 1960 population was nearly 90,000 with manufacturing industries located within the centers providing 16,300 jobs.

Reservoir development is not proposed within these areas. Because of the areas' proximity to the Finger Lakes, recreation and water supply source needs are low. Flooding occurs around the Cayuga Inlet; however, a local flood protection project by the Army Corps of Engineers is expected to result through

development of a State park area along the shores of Cayuga Lake.

Cohocton River Valley Growth Center extends along Route 15 and the Cohocton River from Wayland to Bath. It also includes the Village of Hammondsport on the southern tip of Keuka Lake, eight miles northeast of Bath.

The population of the center is over 28,500 and, although no precise data on manufacturing employment is available, it is estimated to be over 4,200.

Two reservoirs have been proposed for the area which would have an effect on its economy. One, an initial-stage site, is located on Five Mile Creek and would provide storage of 51,000 acre-feet with water surface of 1,440 acres. Its primary benefits would be control of downstream flood damages; however, multipurpose use would be great economic advantage to the area. The other site is located on Smith Run and has storage of 12,100 acre-feet. This, too, would help control downstream flood damages but could be used for other purposes.

Hornell-Alfred and Wellsville Growth Centers are located in Steuben and Allegany Counties. According to 1960 population figures, approximately 40,000 people live in these areas, with manufacturing industries employing nearly 4,000.

Proposed reservoir site developments close to the areas are limited to Bennett Creek south of Canisteo and at Stannard on the Genesee River. Stannard Reservoir has multipurpose potential for irrigation, recreation, water quality control and industrial water supply. It would serve as a base for industrial development in the Wellsville area. The proposed reservoir would have a total capacity of 93,500 acre-feet. Together, the Bennett Creek and Stannard Reservoirs would provide storage of 139,100 acre-feet, with a total surface of 3,065 acres. North of Stannard site in the Genesee River Basin, sites at Belfast on the Genesee and south of Birdsall on Black Creek have also been proposed.

These four sites have the greatest potential for multipurpose use and would greatly enhance the economic growth potential of these two centers.

Olean-Bradford Growth Center includes the cities of Olean and Salamanca and parts of eight adjacent towns in New York and the City of Bradford and parts of two townships in Pennsylvania. Part of the growth center is made up of the valley of the Allegheny River from Portville through Olean to Salamanca and northwesterly through Little Valley to Cattaraugus.

The population in 1960 was about 80,000. Manufacturing is a major activity and provides between 10 and 12 thousand jobs.

Proposed reservoir development near this region is limited to two sites north of Cattaraugus. The Cattaraugus Creek site has a potential for 840,000 acre-feet of storage and 8,600 acres of water surface area. This is by far the largest site in western New York. Locations at Otto and Springville are alternatives to this site. Another site, at Bagdad on Clear Creek, has 15,000 acre-feet storage potential.

Ashford Growth Center is one of the least developed of the growth centers. However, the recently established Western New York Nuclear Center in Ashford should provide a tremendous stimulus for future economic development.

The growth center covers an area along Route 219 from Ellicottville north to Springville in Erie County just across the Cattaraugus Creek. In 1960 its population had reached about 19,000. Nearly 1,000 people were employed by industry in the region and another 200 are expected to work at the Nuclear Service Center when in full operation.

Reservoir development sites are the same as for the Olean-Bradford Growth Center.

Chautauqua-Lake Warren and Dunkirk-Lake Erie Growth Centers are both located in Chautauqua County. The first is situated along the west and southern shore of Chautauqua Lake and extends from Mayville to Jamestown into Pennsylvania. The Dunkirk-Lake Erie growth center extends from Cattaraugus Creek on the north, along Lake Erie to the New York-Pennsylvania border on the south.

The 1960 census figures indicate that approximately 150,000 people reside in the area. The manufacturing industries employ about 16,300 of these residents.

Reservoir developments proposed for construction or survey scope planning in or near these two regions are on Cattaraugus and Conewango Creeks and tributaries to Chautauqua Lake.

Harbors of Refuge for small boats are proposed at Dunkirk and Lake Erie State Park and should be constructed as soon as funds become available.

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PART 6. WATER RESOURCES DEVELOPMENT PROJECTS

The economy of Appalachia will be greatly enhanced by water resources developments particularly multipurpose reservoir projects. Programs of multipurpose water resources development will help stimulate economic activity by providing an environment under which the benefits of private enterprise promise to be higher than they would be otherwise. Multipurpose reservoir projects will make the area more attractive to industry by providing an adequate supply of water for industrial use; they will provide protection against flood hazard and allow for expansion of areas where flooding inhibits growth, and they will provide the area with needed recreation centers.

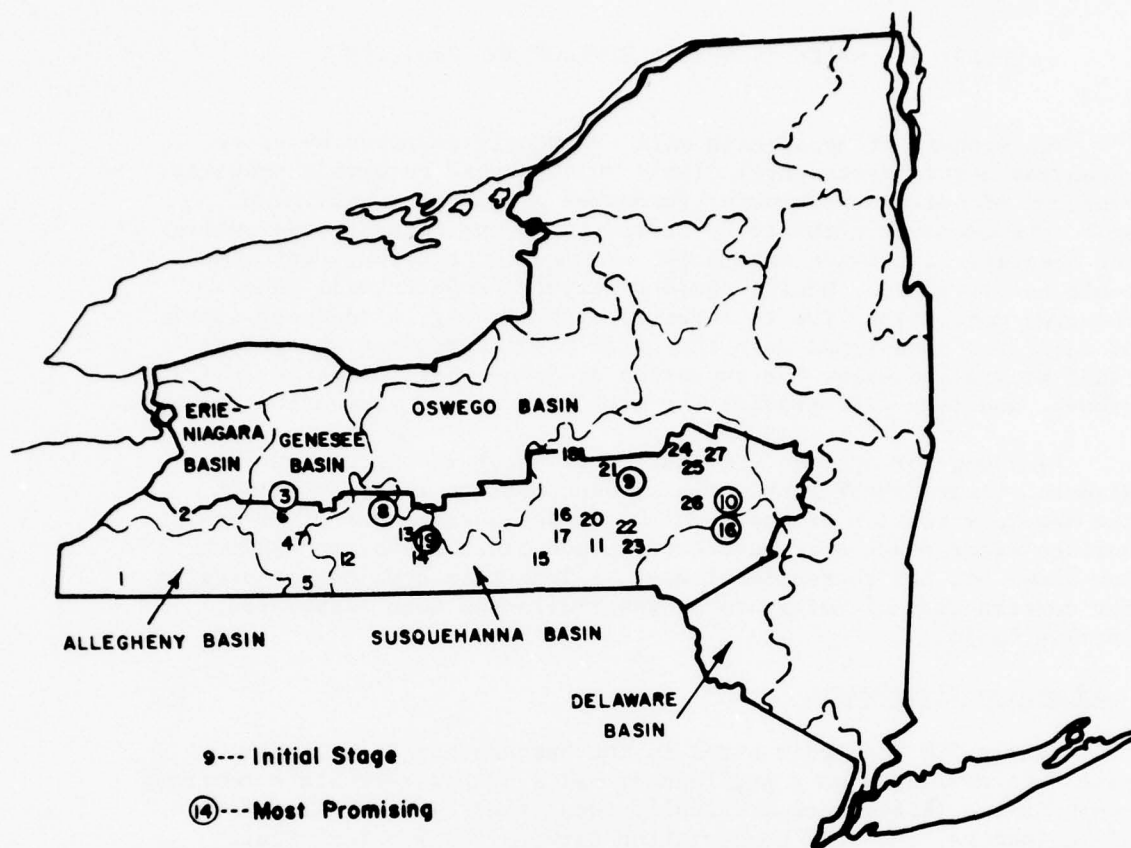
Planning for optimum utilization of water resources must be directed toward several objectives, depending on location within the New York portion of Appalachia. In the Susquehanna River Basin, surface water storage is needed to reduce flood flows, to augment low flows and for recreational use. A long-term development program for construction of multipurpose reservoirs has been formulated in this basin.

Susquehanna River Basin

Nearly 200 reservoir sites in the Susquehanna River Basin have been evaluated on a preliminary basis by New York State contract consultants. Sites were originally identified by U. S. Army Corps of Engineers, the Soil Conservation Service and New York State contract consultants. Some of the sites have been authorized since 1936 for single purpose flood control construction by the Corps of Engineers. Development of these sites must be in the form of a reservoir system for the basin, because no one site can satisfy all the multiple long-range needs of the basin in terms of flood control, water supply, water quality control, recreation and fish and wildlife.

The State has identified twenty sites as having the greatest potential for multipurpose development in the Susquehanna Basin. (See Figure 11 and Table 1.)

The estimated cost of total development is \$241,000,000 on the basis of 1965 price levels. The sites would provide about 845,000 acre-feet of storage and 28,500 acres of water surface. The storage would be adequate to meet all foreseeable water needs within the Basin through 2020. About 70 percent of the storage would be used for stream regulation to provide water for public water supply, irrigation, fish and wildlife and water quality control. Twenty-five percent of the storage is needed for flood control.



RESERVOIR DEVELOPMENT IN APPALACHIA

Figure II

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TABLE 1. PERTINENT DATA FOR MOST PROMISING RESERVOIR SITES IN APPALACHIA**

RESERVOIR NAME	STREAM	DRAINAGE AREA SQ. MI.	STORAGE AREA FEET (000)	SURFACE AREA ACRES	POSSIBLE USE
ALLEGHENY RIVER BASIN					
Chautauqua No. 11	1 Goose Creek	12.8	14.0	500	M, F, R
ERIE-NIAGARA BASIN					
Cattaraugus	2 Cattaraugus Creek 2A Otto (1) 2B Springville	317.9	840.0	8,600	M, F, R, I, P
GENESEE RIVER BASIN					
Portage	3 Genesee River	985.0	283.0	6,500	M, F, Q, R, I, P
Belfast	4 Genesee River	580.0	188.0	4,500	M, F, Q, R, I, P
*Stannard	5 Genesee River	168.0	93.5	2,300	M, Q, R, I, P
Wiscoy	6 Wiscoy Creek	108.0	39.0	800	M, Q, R, I, P
Site 7-2	7 Black Creek (Allegany County)	15.7	12.5	1,170	R
SUSQUEHANNA RIVER BASIN					
*Five-Mile Creek	8 Five-Mile Creek	66.0	51.0	1,440	F, Q, R
*South Plymouth	9 Canasawacta Creek	57.0	38.0	820	F, Q, R
*Charlotte Creek	10 Charlotte Creek	164.0	127.0	2,850	F, Q, R
	11 Genegantslet Creek	95.0	34.0	1,010	F, Q, R
	12 Bennetts Creek	59.0	45.6	765	Q, R
	13 Smith Run	13.4	12.1		Q
	14 Meads Creek	44.0	34.1	805	Q, R
	15 Owego Creek	77.0	23.1		R
	16 Jennings Creek	14.1	30.9	470	Q
	17 Culver Creek	10.9	13.1	314	Q
	18 W. Br. Tioughnioga Creek	36.4	44.2	1,100	F, Q

TABLE 1. PERTINENT DATA FOR MOST PROMISING RESERVOIR SITES IN APPALACHIA** (Continued)

RESERVOIR NAME	STREAM	DRAINAGE AREA SQ. MI.	STORAGE AREA FEET (000)	SURFACE AREA ACRES	POSSIBLE USE
Mud Creek	19 Mud Creek	75.0	62.0	4,000	F,R,Q
	20 Otselic River	255.0	68.6		Q,R
	21 Otselic River	54.0	41.8	1,360	Q
	22 Ludlow Creek	5.9	10.3	364	R
	23 Wilkins Brook	10.9	24.0	350	Q
	24 Unadilla River	107.5	80.0	3,000	F,Q
	25 Wharton Creek	45.2	34.6	940	Q
	26 Otego Creek	108.0	65.0		F,Q,R
	27 Fly Creek	10.0	11.1	318	Q

M-Municipal & Industrial Water Supply, Q-Water Quality Management, I-Irrigation, F-Flood Control,
R-Recreation, Fish & Wildlife, P-Power
*Initial Development Site

**Evaluated by New York State contract consultants

(1) Otto and Springville have been selected by the Corps of Engineers as alternates to Cattaraugus
Creek Site

The remaining five percent would be retained in conservation pools for recreational use.

The largest reservoir would be a site on Charlotte Creek. It would provide as much as 127,000 acre-feet of storage and cost about \$23,700,000. The smallest reservoir would be on Ludlow Creek. It would have 10,300 acre-feet of storage and cost about \$2,000,000.

The system of reservoirs can be implemented by stages on a long-term basis because immediate construction at all the sites is neither required nor practical. The most urgent present need is for flood protection to reduce flood damages and provide opportunities for land enhancement; thereby contributing to economic growth in the basin. Four of the twenty reservoirs would provide significant flood control benefits and are in the first-stage development category. The sites are Five Mile Creek, Charlotte Creek, South Plymouth and Mud Creek. The total estimated cost of reservoir construction is \$80,000,000.

Charlotte Creek project is a multipurpose development for low-flow augmentation, flood control and recreation. This proposed reservoir could add 2,200 acres of water surface and as much as 118,000 acre-feet of storage for multiple use in the Susquehanna Valley. In addition, proposed sites on Otsego Creek and Wilkins Brook would provide a total of 89,000 acre-feet of storage and well over 1,000 acres of surface.

An economic impact study of the Charlotte Creek Reservoir project is scheduled for completion in late 1968.

The objectives are to determine the economic feasibility of locating specified types of manufacturing plants in the area of influence of a multipurpose water resources dam and reservoir proposed at Charlotte Creek, and to quantify (in dollar values) the incremental economic changes, both positive and negative, which would occur in the Eastern Susquehanna River Basin in New York State as the result of the dam and reservoir and the location and operation of specific manufacturing plants in the area of influence of the Charlotte Creek multipurpose water resources project.

The types of economic changes and effects to be considered include:

1. Direct and indirect effects of the manufacturing plants after their construction and operation.
2. Flood control
 - a. Agricultural
 - b. Urban

3. Water Quality Management
 - a. Flow augmentation
 - b. Water pollution
4. General outdoor recreation
5. Relocation of persons
6. Relocation of public facilities
7. Investments, including construction of dam, reservoir, manufacturing plant and related facilities
8. Fish and Wildlife Preservation Enhancement
9. Water Supply
 - a. Municipal and industrial
 - b. Supplemental irrigation
10. Foregone opportunities

The types of manufacturing plants to be considered include meat products, canned and frozen foods, pulp mills, paper mills (except building paper mills), paper board mills, synthetic organic fibers (except cellulosic), and biological products.

Cattaraugus Creek Reservoir is a multipurpose project for flood control, recreation, power and irrigation. Preliminary analysis shows this project as economically feasible. New York State has requested the Buffalo District Corps of Engineers to investigate two alternate sites. One is located near Otto on the south branch of Cattaraugus Creek; the second near Springville between Cattaraugus Creek site and Buttermilk Creek. The second site would require the diversion of nuclear wastes around the reservoir.

South Plymouth: One initial stage reservoir site is located in the Chenango Valley. The South Plymouth site on Canasawacta Creek would provide a total of 820 acres of surface and 38,000 acre-feet of storage. Development of this site would aid in flood control in the lower part of the Chenango River with some quality control benefits and would enhance the recreational potential for the area as well as other urban areas such as Binghamton and Elmira.

Mud Creek Reservoir near Savona in Steuben County is an initial stage reservoir that the plan formulation work group in the Susquehanna Coordinating Committee Study is proposing for early development. This site would provide for 62,000 acre-feet of storage with a

surface area of 4,000 acres. Multipurpose development of this site would aid in flood and water quality control in the lower part of the Cohocton and Chemung Rivers, and would provide benefits for recreation, fish and wildlife and water supply.

Five Mile Creek is an initial-stage site in the Cohocton River Valley. It would provide storage of 51,000 acre-feet with a water surface of 1,440 acres. Its primary benefits would be control of downstream flood damages but multipurpose use would be a great economic advantage to the area.

Another site in the first-stage development category might be Portage. Although the dam site is not located in Appalachia, part of the reservoir would be in Allegany County. This multipurpose project could provide additional recreational opportunities. Recreation here would generally be compatible with flood control. Impact studies and additional analyses of various alternatives are needed before this project can be recommended and determination made of local acceptance of various alternatives.

The estimated capital cost of the Portage Reservoir project in the Genesee River Basin Coordinating Committee Study is \$25,000,000. The reservoir would have 283,000 acre-feet of storage and a surface area of 6,500 acres. The Portage site has the largest potential storage in the Genesee Basin and unit costs are relatively low.

In addition to these reservoir sites, several others have been proposed for Appalachia by the Corps of Engineers.

Stillwater, Cassadaga, Conewango and Goose Creek Reservoirs - These four proposed reservoirs have potential for multipurpose development for flood control, municipal and industrial water supply, recreation and fish and wildlife, irrigation, flow augmentation and pump storage power development. Under-utilized lands in the valley below these proposed reservoirs could be made available for industrial, commercial and residential development. The additional water supplies, peaking power and recreational facilities needed for economic growth could also be supplied by these reservoirs. Conewango Creek, Cassadaga Creek and Stillwater Creek are located in the Conewango Creek Basin.

The flood protection afforded by the Conewango and Cassadaga Reservoirs would extend primarily along the middle reaches of Conewango Creek as they occupy the headwaters of the basin. Stillwater Creek would control runoff from the further downstream area which contributes to an earlier peak flow in the lower basin.

These three reservoirs could best operate as detention reservoirs as they control the headwaters of the stream and the delay of upstream

runoff would be long enough to permit early downstream flow to pass without damaging augmentation.

Projection of population in Chautauqua and Cattaraugus Counties shows an increase of about 300,000 by 2020. Development of the Conewango Valley would account for much of this growth. Groundwater in the growth centers is not adequate for water supply and surface storage will be needed. The Conewango Creek Reservoir would provide 26,000 acre-feet, Cassadaga Creek 18,000 acre-feet, and Stillwater 5,800 acre-feet for this purpose.

Recreation lakes with an initial area before water supply drawdown would be 5,000 acres, 3,000 acres and 790 acres in extent, respectively.

These reservoirs are outstanding for economic development of the growth areas.

Preliminary studies for these reservoirs should be undertaken and a time-phased plan of development should be prepared for feasible projects.

PART 7 FUTURE PLANNING AND IMPLEMENTATION

State's Role in Future Project Planning

The planning, development and management of water resources are responsibilities shared by agencies at all levels of government - local, State and Federal. On this premise, many forces can be applied to move project planning forward through successive stages. The State, through Regional Water Resources Planning Boards created under existing State law, can develop project plans resulting from comprehensive basin studies. This project planning can be directed by the State Water Resources Commission which is charged with coordinating State agency functions related to water resources and with formulating State policy. The member agencies of the Commission would provide major assistance in their areas of responsibility.

Two Regional Water Resources Planning Boards now operate in the Appalachian region of the State. Two more are being formed. Through these Boards, the State will insure that the optimum project planning will result in attaining the ultimate in economic growth to the region.

Institutional Arrangements for Financing of Plan Implementation

Project financing is frequently a stumbling block but can be expedited by cooperative effort. Existing national programs provide for payment of construction costs and cost-sharing for certain types of projects and for various project purposes. The Corps of Engineers is the major water resources project construction agency in New York.

New areas of cooperation are being explored. For example, the State might undertake the responsibility for feasibility investigations and design for structures in a comprehensive river basin development plan evolved in cooperation among State and Federal agencies, with the cost of these responsibilities later to be reimbursed through Federal appropriation. This would, of course, involve prior agreement with the Federal construction agency which would normally undertake these activities.

Another possibility is the obtaining of first instance funds from the Federal government for facility construction to meet special functions, such as recreation storage in reservoirs.

The State has a primary interest in plan implementation and could assume an appropriate share of cost. The citizens of the State recently demonstrated their concern for water resources by approving a \$1 billion bond issue to fight water pollution. With

water supplies of adequate quality, the next logical objective is greater utilization through multipurpose development. Local communities likewise have a major interest in projects in their vicinity and can be expected to share in the costs as well as benefits. The belief that project costs should be allocated among beneficiaries in proportion to their benefits is basically sound and widely acknowledged.

Maintenance and operation costs logically might be borne by a joint State and local community agreement. Increased local revenue from anticipated economic enrichment of the areas particularly affected by the structures would provide a strong fiscal base for local government cost sharing.

State and local cost sharing in Federal projects is now under study by the State Water Resources Commission.

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DEPARTMENT OF THE ARMY
OFFICE OF APPALACHIAN STUDIES, CORPS OF ENGINEERS
REPORT FOR
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA

PART V
STATE WATER SUPPLEMENTS

CHAPTER 7
NORTH CAROLINA WATER SUPPLEMENT

Prepared by
North Carolina State Planning Task Force
and
North Carolina Department of Water and Air Resources

1968

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I. OVERVIEW

Preface

The North Carolina State Supplement to the Appalachian Water Resources Development Plan consists of three parts: (1) an overview; (2) a progress report on special studies currently being conducted in the North Carolina Appalachian area; and (3) a series of position papers presented by State Departments and Area Organizations.

The substance of this Supplement is intended to be broadly representative of the views of many elements of State and local government, as well as area development organizations - all concerned with North Carolina Appalachia. These views are presented for consideration as they relate to federally-conceived water resource programs.

Management Considerations as Related to Law

The State of North Carolina is faced with the need to manage its water resources for the best interests of its people and in consonance with the interests of the nation, neighboring states, and the property rights of land owners. Management is a broad term that includes all the institutions, legal controls, physical operations, and the planning for the use of the resources by whomsoever. It is concluded that Appalachian North Carolina has generally an ample water supply. However, if the desired economic growth is to be attained, an appropriate development of water resources will be required. There are now and there will be problem areas involving competitive uses and other factors that require:

1. Water rights and water control legislation.
2. Control and management measures by the State Government.
3. Water project construction.

The State of North Carolina has been, and is, an area where the system of water law described as the riparian rights system is the basis for resolution of water-use problems. What can and cannot be done depends upon (1) whether any statutory law exists and is applicable; (2) whether an act is contested; (3) whether previous case law in the State provides precedents; and finally, (4) what the decision is in any new contest that arises.

A study issued by the Department of Water Resources in 1966, entitled Wise Management of North Carolina Water Resources through Law, established in two initial volumes that statutory enactments were needed

and stated a finding that specific areas in the State showed indications that definite water management action by the State Government might be required in the relatively near future. The areas so identified in the Appalachian Region were the French Broad, Pigeon, and Tuckasegee River Basins. The third volume of Wise Management, published in April of 1967, recommended a number of specific statutes. The 1967 General Assembly acted favorably upon the recommendations, approved the consolidation of the State Stream Sanitation Committee with the Board of Water Resources, and added the responsibility for air pollution control. The significant laws passed were:

1. The reorganization law (creating the Board of Water and Air Resources).
2. Water Use Act of 1967.
3. A provision to permit the Department of Water and Air Resources to provide assurances for water supply and other purposes in federally-constructed projects.
4. A provision empowering the Board to establish a system of water-use reporting.
5. Dam Safety Law of 1967.
6. A provision authorizing the Department to assist and participate in planning a program of flood plain management.
7. Technical changes to the Well Driller Registration Act and to well information reporting.

These laws provide an initial statutory basis for the State Government to take the initial steps that may be necessary in solving present and future problems. Experience and further study will point the way to future statutory needs. See Appendix A for further details of these laws.

Management Considerations as Related to Planning and Programming

In considering the control and management of water resources by governmental or private entities and the relationships and responsibilities of State governmental agencies in particular, a summary of traditional or inherent responsibilities is considered necessary as a point of reference.

The study of the State's needs for water development is a responsibility shared between Federal, State and local agencies. Consequently, coordination is an important feature as is cooperation. The State of

North Carolina policy on the responsibility is expressed in part by various statutes and in part by executive actions and attitudes or by legislative action and attitudes.

The State welcomes and seeks Federal planning in its water areas preferably on an equal partnership basis. To cooperate effectively with the Federal government, and at the same time furnish leadership for local participation, requires a considerably higher level of attention in the State Government than has been the case in the past. The steady, though slow, increase in funds for State agency water planning is an indication that State policy now is beginning to be formed toward the idea of effective participation.

State policy favors regional and cooperative planning by cities and counties with related interests, rather than exclusive state-wide planning by State agencies.

State policy now favors better planning coordination, as well as more active planning programs as evidenced by the creation of the State Planning Task Force Division in the Department of Administration, and the State Planning Task Force (delegates from State agencies). This method of organization also is an expression of the view that the various planning echelons in the numerous old-line and newer State departments, commissions, boards, authorities, etc., are more fitted by background and experience to develop and consummate a continuing program than an ad hoc planning group or a planning organization remote from the responsibility of performance.

When the Governor established the State Planning Task Force and gave it coordinating responsibility for Federal programs where two or more State agencies were concerned, this was in recognition of the fact that control direction had been lacking and that there was need to provide policy guidance, goals, and standardized data support, particularly in respect to facts and statistics of general nature used by numerous planners for related, as well as relatively unrelated studies.

In this context, the responsibility of the Board of Water and Air Resources has been expressed as the responsibility to develop, coordinate, promote, and program water planning and development. This is a statutory and leadership responsibility carried out on a staff basis within the framework of the State's overall organization for planning with the Governor at the apex.

The major agencies in North Carolina at the State government level with important water and related land resource interests are:

Department of Administration, State Planning Task Force Division, State Property Officer, and Emergency Planning Division

Board of Water and Air Resources
Board of Conservation and Development
Wildlife Resources Commission
State Soil and Water Conservation Committee
N.C. Recreation Committee
Board of Health, Sanitary Engineering Division
State Ports Authority

Major advisory and research roles are assumed by the Water Resources Research Institute and the Institute of Government under the Consolidated University of North Carolina. Other Consolidated University elements such as the various extension services and the specialized schools (environmental sanitation, city planning, etc.) are almost equally involved.

Because water is in some way involved in nearly every human endeavor, as well as being essential to life, even the several key agencies listed cannot successfully perform water development planning without drawing in others who have an interest. At the end of this summary report there is a special table, in tentative form (Table S-1), which depicts relative responsibilities in water resource planning and development. It should be studied carefully because it shows, probably as simply as it can be done, the complex inter-relationships in regard to water and water-related matters, particularly as to North Carolina State government entities.

Water Quality Control

The comprehensive water quality control program in the State of North Carolina dates from 1951 when the first stem sanitation law was passed. In a statement of policy, the General Assembly declared that the water resources of the State shall be prudently utilized in the best interest of the people and that the government of the State shall assume responsibility for the quality of water resources.

Classifications and water quality standards for surface waters were adopted in 1953. These standards were established on the basis that the North Carolina system is a stream classification system, one in which each stream and body of water in the State is studied to determine its best use, both from the standpoint of public desire and technical practicability. After field studies are made, pollution survey reports issued, and public hearings held, classifications are adopted and thereafter the entire regulatory activity is pointed toward preserving the stream so that the actual water quality is always equal to or higher than the adopted classification.

In keeping with the State motto (Esse Quam Videri - To Be Rather than to Seem), the North Carolina State Stream Sanitation Committee

adopted standards and classification that were responsive to the desires and needs of the people as far as possible with the additional consideration of technical and practicable feasibility. This is an important point because it has long been known that some jurisdictions which adopted idealistic standards honored them mostly in the breach.

The initial step after the adoption of standards was the preparation of pollution survey reports for each river basin. These took the better part of ten years and the resulting published documents aggregated at least two feet in height and thousands of pages. Following the classification of the streams, a comprehensive pollution abatement plan was prepared for each river basin, the last of which was adopted on December 17, 1963.

The Water Quality Act of 1965 (P.L. 89-234) established the requirement for Federally approved standards for interstate waters. North Carolina's proposed standards for these waters have been approved with certain exceptions. The assigned standards are similar to those originally adopted for assignment to North Carolina's waters with certain numerical specifications now formally incorporated in the standards themselves rather than as Board policies. Other changes included the deletion of the original Classes E and SD and those of a minor nature. The Board of Water and Air Resources is presently considering the exceptions to the standards assigned to the interstate water with the view of recommending appropriate action to the Governor of North Carolina.

The adopted classifications are listed below. In addition, within some classes, the Board may formally designate some waters as trout waters or swamp waters.

Class A-I - Suitable for drinking, culinary, or food processing with relatively little treatment.

Class A-II - Same with higher degree of treatment.

Class B - Suitable for bathing.

Class C - Suitable for fish and wildlife propagation.

Class D - Suitable for agriculture, industrial cooling and process water supply, fish survival, navigation, and other lower uses.

Class SA - Salt or brackish. Suitable for shellfishing for market purposes.

Class SB - Salt or brackish. Suitable for bathing.

Class SC - Salt or brackish. Suitable for fishing.

The State of North Carolina has made major progress in cleaning up the streams of the State. However, there is great public misconception on the subject and on the matter of responsibilities. The Board of Water and Air Resources administers the stream sanitation law and issues permits to municipalities and industries controlling the treatment and release of wastes to the waters of the State. The Board of Health approves sources of public water supply and controls the sanitary quality of water of streams and lakes designated for public water supplies through rules and regulations and the two Boards work in conjunction to assure protection of these supplies. The Board of Health also is responsible for waste discharges from State institutions and other places over which it has supervisory jurisdiction. The control or deposition of bottles, trash, and garbage into streams is a police power responsibility subject to enforcement by or through local or county health officers. There is no effective machinery for controlling sedimentation from construction, or agricultural wastes such as toxic sprays except when some massive toxic condition or sediment discharge creates a fish kill and the wildlife and water pollution control agencies are unable to trace the responsibility to some specific cause that is responsible.

The basis for controlling waste discharges by permit is to relate the ability of the receiving stream to accept a discharge during the low-flow period identified as the average seven-day minimum flood recurring once in ten years, taking into consideration high temperature conditions as well. Under the general policy that secondary treatment or equally effective treatment and control is required, the Population Equivalent of the summation of all treated waste discharges to a particular stream must not result in violating stream classifications during the cited low-flow condition.

If existing discharges do not contravene the stream standards, the available water for population growth and industrial growth sets a limit on such growth unless a higher degree of treatment is economically and technically feasible or additional water can be stored and released as needed.

Water quality conditions and project information concerning waste treatment facilities is summarized in the river basin status reports.

Ground Water

As in most of North Carolina, ground water is the predominant source of water for domestic purposes in the Appalachian Region. It is also the source of many commercial and industrial supplies, although only a fraction of its potential has been developed.

The water-bearing formations of the region are chiefly igneous and metamorphic rocks, in which the water occurs in secondary fractures and

the zone of weathered rock. As is characteristic of this type of aquifer, the yield of individual wells drilled at random locations is generally small to moderate. Prediction of yields is not possible because of the irregular pattern and depth of fractures. However, by drilling at carefully selected sites, dependable water supplies of 50,000 to more than 500,000 gallons per day may be obtained throughout most of the region from a relatively small number of wells. Most municipalities and industries seeking quantities of water in this range have been successful, although not every well drilled has been productive.

The excellent chemical quality and organic purity of the ground water is one of the most important considerations, particularly from the standpoint of domestic use, as well as for the requirements of certain types of industry. The low and constant temperature of the water at higher elevations is of particular significance with regard to the potential for specialized industries.

Ground-water supplies are ideal for commercial establishment, industries and residential areas outside the larger municipalities. Little, if any, treatment is needed and the cost of development is only a fraction of pipeline cost and upkeep, and such systems may be expanded as water requirements demand.

Unfortunately, however, in a large number of instances, the economics of water supply appear to be ignored or discounted for one or more reasons by both Government and private interests. Federal funds in the form of grants or loans are readily available for surface water projects that, in effect, provide an expensive visible investment and monument, yet few government or private interests seem to understand or appreciate the magnitude and dependability of the ground-water reservoir. Also, because of the great difference in first cost, it appears that the usually moderate profit to be realized from the development of ground-water supplies could well have a discouraging effect on ground water development. Possibly another reason for not considering the economy of ground water development could be to justify and absorb a part of the cost of waste-disposal systems, as a system of water lines is often thought to be a prerequisite for waste-disposal lines. Therefore, it appears to be an easy expedient to describe the ground-water supply as inadequate, undependable, or of poor quality, even though such evaluation cannot be supported by data.

Most evaluations of ground water availability in the region have been based on an inventory of a fraction of the existing wells. Most of these wells were drilled for domestic supplies at random sites and to the minimum depth necessary to provide a satisfactory supply for domestic use. Thus, the yields of such wells do not accurately reflect the availability of ground water in most areas. Sufficient records are available, however, to show that the basic water requirements of the entire population of any county could be met by utilizing a relatively small number of the existing wells.

Comprehensive water resource planning requires that all water be considered as part of the single-water system (commonly called hydrologic cycle) and that ground and surface water be considered and utilized according to the merits of the proposed uses. In practice, most comprehensive river basin plans of the past have given limited attention to ground water. The layman looks on ground water occurrence as somewhat of a mystery and perhaps questions its economy and reliability.

Many studies are in progress at present, which concentrate separately on ground water and surface water matters. It is expected that, as time progresses, North Carolina water plans will more clearly reflect an integrated consideration of ground and surface water.

Appalachian Fishery

One of the great natural resources of the Appalachian Region in North Carolina is the fishery resource. It is important to the people of the region, to the fishermen of North Carolina, and to the fishermen in the entire southeast. The trout fishery is the most important. North Carolina, with its 2,000 miles of trout streams open to the public has more such streams than any other State in the southeast. They are managed and stocked by the Wildlife Resources Commission at public expense and the continued development of these recreation facilities is an important inducement to the growth of the region. Conversely, the economic and industrial growth projected should entail preservation of this resource.

Manner of Relating Local Development Districts and River Basins

The North Carolina State Supplement is designed around the seven local development districts and the river basins which constitute hydrologic units within Appalachia. In general, the problems and projected needs of each local development district are analyzed. Then the requirements for water resources development are reviewed in terms of development measures required. The appendices relating to local development districts are not included in this summary report. These requirements are combined with water development needs not directly related to the local development districts, such as area-wide requirements or out-of-state requirements treated on a river basin basis, and the real meat of the North Carolina State Supplement is found in the river basin sections. The following table relates the local development districts and the river basins to each other. (See, also, Plate 1.)

<u>Local Development Districts</u>	<u>River Basins</u>
A. <u>Alexander-Burke-Caldwell</u> Alexander, Burke, & Caldwell Cos. See: 3, 13	1. <u>Broad</u> See: C, G
	2. <u>Cape Fear</u> See: E

Local Development Districts

- B. Blue Ridge
Allegheny, Ashe & Wilkes Cos.
See: 7, 13
- C. Isothermal
McDowell, Polk, & Rutherford Cos.
See: 1, 3
- D. Mountain Scenic
Avery, Mitchell, Watauga, & Yancey Cos.
See: 3, 7, 8, 12, 13
- E. Northwest
Davie, Forsyth, Stokes, Surry & Yadkin Cos.
See: 2, 10, 13
- F. Southwestern
Cherokee, Clay, Graham, Jackson, Macon, & Swain Cos.
See: 5, 6, 11
- G. Upper French Broad
Buncombe, Haywood, Henderson, Madison, & Transylvania Cos.
See: 1, 4, 9, 11

River Basins

- 3. Catawba
See: A, C, D
- 4. French Broad
See: G
- 5. Hiwassee
See: F
- 6. Little Tennessee
See: F
- 7. New (Kanawha)
See: B, D
- 8. Nolichucky
See: D
- 9. Pigeon
See: G
- 10. Roanoke
See: E
- 11. Savannah
See: F, G
- 12. Watauga
See: D
- 13. Yadkin-Pee Dee
See: A, B, D, E

The appendices to the State Supplement contain considerable information on water problems and needs within each local development district and rough computations were made of possible future needs. Several population projections were made by different authorities under different assumptions. In this report, the largest projections were used on the premise that some overestimating of water need is preferable to underestimation. The population projections which follow were predicted on the assumption by the Office of Appalachian Studies that balanced economic and industrial development required to bring all of Appalachia up to a point approaching the national average per capita income within the general time frame of this study would generally require the indicated growth. Hence, the totals are tied to a specific assumption, rather than a firm State of North Carolina objective.

Local Development District	Actual 1960 Pop.	Estimated July 1 '67 Population	Predicted Population		
			1980	2000	2020
A-B-C	117,878	132,138	153,000	253,000	374,000
Blue Ridge	72,771	77,794	101,000	175,000	283,000
Isothermal	83,228	86,647	110,000	173,000	254,000
Mountain Scenic	57,452	58,265	75,000	110,000	157,000
Northwest	299,479	325,752	417,000	721,000	1,163,000
Southwestern	69,395	69,617	91,000	128,000	178,000
Upper French Broad	<u>239,537</u>	<u>261,667</u>	<u>316,000</u>	<u>436,000</u>	<u>606,000</u>
	939,740	1,011,880	1,263,000	1,996,000	3,015,000

As can be seen, the growth increases about one-third by 1980, and more than triples by the year 2020. Also, the heaviest concentration of growth is in the Districts containing Asheville and Winston-Salem.

Experience has already shown that growth is accelerating in these two growth areas and in several other secondary growth areas, largely along the existing Interstate and U.S. highways. Consequently, it is expected that urban and industrial growth will continue along those highways, as well as along other similar highways, and the Appalachian Corridor Highways when they are completed. Water-dependent industries must necessarily locate near remaining sources of suitable water. The State Planning Officer has commissioned a consulting firm, Rummel, Klepper, and Kahl, to investigate the estimated feasible expansion projects for water supply and sewerage systems along these highways with the expectation that a way may be found to expand these facilities sufficiently in advance of need to help promote the desired growth. This firm's report will not be available in time to incorporate the results in the State Supplement, although some advance estimates are cited.

This Department is committed to preparation of accurate current water use to provide a solid base for projecting estimates into the future. The staff effort needed for this purpose precludes any early compilation of results. An early survey made by the Board of Water Commissioners for 1956 is used for check point purposes and we have prepared order of magnitude estimates and projections for each local development district insofar as feasible. These follow:

<u>Local Development District</u>	<u>Community and Community Industrial and Rural without Industrial</u>			
	<u>Current</u>	<u>1980</u>	<u>2000</u>	<u>2020</u>
	<u>Quantity of Water</u>			
				(A-F)
A-B-C	10,289	13,895	24,192	36,313
Blue Ridge	5,573	8,475	15,966	26,951
Isothermal	7,460	10,263	16,676	25,011
Mountain Scenic	4,715	6,550	10,093	14,807
Northwest	28,423	42,045	73,203	120,356
Southwest	5,919	8,135	11,608	16,970
Upper French Broad	23,773	31,985	44,617	62,664
	86,152	121,348	196,355	303,072

Average Daily Use Rate Corresponding
to Preceding Quantities (MGD)

A-B-C	9.2	12.4	21.6	32.4
Blue Ridge	5.0	7.6	14.3	24.1
Isothermal	6.7	9.2	14.9	22.3
Mountain Scenic	4.2	5.8	9.0	13.2
Northwest	25.4	37.5	65.4	107.5
Southwest	5.3	7.3	10.4	15.2
Upper French Broad	<u>21.2</u>	<u>28.6</u>	<u>39.8</u>	<u>55.6</u>
	77.0	108.4	175.4	270.3

<u>Local Development District</u>	<u>Agricultural Water Use*</u>			
	<u>Current</u>		<u>Year 2020</u>	
	<u>Irrigation</u>	<u>Cattle</u>	<u>Irrigation</u>	<u>Cattle</u>
	<u>Quantity Basis - Acre-Feet Per Year</u>			
A-B-C	250	445	30,000	890
Blue Ridge	1,220	1,180	30,000	2,360
Isothermal	260	350	30,000	700
Mountain Scenic	590	560	10,000	1,120
Northwest	6,200	1,285	50,000	2,570
Southwest	320	580	10,000	1,160
Upper French Broad	<u>1,025</u>	<u>1,440</u>	<u>20,000</u>	<u>2,880</u>
	9,865	5,840	180,000	11,680

* The manner in which these figures were derived necessitates their being considered highly speculative. Ultimately, a more rational basis for estimating will be developed.

Local Development District	Average Daily Rate Basis - Millions of Gallons			
	Current		Year 2020	
	Irrigation	Cattle	Irrigation	Cattle
A-B-C	0.2	0.4	26.7	0.8
Blue Ridge	1.1	1.1	26.7	2.1
Isothermal	0.2	0.3	26.7	0.6
Mountain Scenic	0.5	0.5	8.9	1.0
Northwest	5.5	1.1	44.6	2.3
Southwest	0.3	0.5	8.9	1.0
Upper French Broad	0.9	1.3	17.9	2.6
	8.7	5.2	160.4	10.4

A self-supplied industrial water use totalling 105,000 acre-feet (93.8 millions of gallons per day) now exists, mostly in the Upper French Broad Local Development District. It was not feasible to project this type of use to the year 2020 in the local development districts. However, an attempt was made to incorporate such projections in each river basin.

In considering the needs of Appalachia, both in respect to growth of the chosen economic development units (the seven districts) and in respect to State-wide and interstate considerations, certain assumptions have been made. These are that growth will generally be as predicted in the Office of Appalachian Studies population studies; that growth will parallel the interstate and development highways; and that the primary and secondary growth centers and the urban centers identified by Hammer, Siler, and Greene in their study, will, in fact, grow as predicted.

Certain other assumptions have been made that relate to the foregoing. The quality of the environment should be enhanced to preserve the natural recreational attractiveness of the region. This would imply that wildlife resources would be preserved and developed to a consistent degree and that water supply and waste treatment facilities should be brought up to a minimum standard whether or not in a designated growth area, and particularly if upstream from a growth area.

Broad River Basin

The Broad River Basin in North Carolina totals 1,508 sq. mi. of which 1,012 sq. mi. are in Appalachia. The present population in the basin (1960) is estimated at 64,000. Most of the basin is in the

Isothermal Local Development District, although some attractive mountain areas are in the Upper French Broad Local Development District.*/

The average annual yield of surface water is approximated based on gaging stations near Boiling Springs and the North Pacolet River near Tryon. This is 1,186,000 acre-feet which would be about 1,059 million gallons per day. The water is of generally good quality. Ground water of good quality is obtainable in reasonable quantities.

Four relatively small power dams are in the basin. Nineteen significant communities account for about one-third of the population in the basin. Apparently, only seven have community water systems. Three municipalities have satisfactory waste collection and treatment systems, while six with waste collection systems have inadequate treatment facilities at the present time. In addition, there are 11 communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to imply that sewage collection and treatment facilities are needed for all of these communities, such facilities are needed in many instances to prevent public health nuisances and potential health hazards as well as to provide an opportunity for economic development.

Based on relatively incomplete and not too reliable use data, the total 1966 water use (exclusive of hydro-electric power generation and similar uses), was probably 8,300 acre-feet or 7.9 millions of gallons per day.

The principal water resource planning now in progress included the Appalachian study, a review of reports on the Santee River Basin (both by the U.S. Army Corps of Engineers), a study by the Soil Conservation Service under Sec. 6, P.L. 566, covering the entire Santee River Basin, selected small watershed studies under P.L. 566, county-wide water and sewerage studies under grants from the Farmers Home Administration, and the beginning phases of the North Carolina Water Plan (Broad River) by the N.C. Department of Water and Air Resources.

There are no unusual problems in the development of the Broad River Basin that cannot be solved by vision and money. The requirements, insofar as they can be defined at this time, can be met. The need for water for irrigation by the year 2020 is tentatively set at 20,000 acre-feet, subject to later analysis in depth. The community water supply needs, including industries served, project to about 14,000 acre-feet,

*/ A medium thrust of economic growth extends along the Rutherford-Spindale-Forest City axis. All three towns are classified as secondary growth centers. A scattered level of economic activity parallels Interstate Highway No. I-26 between Columbus and Tryon, both of which are classified as urban centers.

in 2020. The corresponding rural domestic use would be 4,000 acre-feet. The existing self-supplied industrial use appears to be about 15,000 acre-feet. An arbitrary choice of 10,000 acre-feet for this type use by 2020 is probably conservative.

Flood control needs are minor at present. However, growth and more intensified agriculture will require measures, both physical and regulatory, that cannot be too specifically defined at present.

There is a continuing need for development of new power facilities, but the District Engineer, Charleston, has determined that hydropower is not economically feasible, and this Department has no data to justify disputing the finding.

Five streams (Pacolet River, Broad River, Green River, Fork Creek, and Bobs Creek) have been defined as needing continuing protection by the Wildlife Resources Commission.

From the quantitative point of view, the total water use in 2020 may not exceed 48,000 acre-feet, an amount which can easily be provided.

Navigation facilities have not been considered as needed or feasible. A large recreational demand has been predicted based on expected growth. The North Carolina Recreation Commission is not yet prepared to supply concrete planning data, but the U.S. Bureau of Outdoor Recreation confirms a major future need.

There is an existing need for at least \$4,000,000 in municipal waste collection and treatment plant construction in the North Carolina portion of the Basin. No significant water quality requirement, in terms of dilution storage, has been identified in North Carolina, but 90,000 acre-feet has been estimated for North Carolina dilution needs by 2020. South Carolina has also estimated a need for 100 MGD future water supply which would be 112,000 acre-feet in a year.

The U.S. Army Corps of Engineers has recommended a major dam on the Broad River near the Clinchfield Railroad Bridge intended to provide flood control, water supply, recreation, water quality, and regional income expansion benefits. The maximum water surface at elevation 825 msl would cover 24,700 acres and the corresponding storage capacity would be 1,156,000 acre-feet. The cost is currently estimated at \$35,700,000 of which \$10,448,000 would be non-Federal.

A feasibility report has been prepared of the Camp Creek - Cane Creek Watershed in Rutherford and McDowell Counties, North Carolina, by the U.S. Soil Conservation Service. This 27,850-acre watershed was studied as part of the Appalachian Water Resources Survey on two bases. The first basis is the provision of a project to meet presently identified needs. The resulting plan contemplates four floodwater retarding

structures, one multi-purpose structure, and 20.3 miles of stream channel improvement. The total estimated cost is \$1,168,300. The second basis assumes that the project should be developed to the full potential of the plan. The total estimated cost, in this case, is \$2,572,800. Adoption of either plan is not required until such time as the local interests concerned have sponsored a work plan and the necessary commitments to assure success of the project. On February 12, 1968, this watershed was expanded to 141,945 acres, renamed the Second Broad River and, authorized for Federal planning assistance.

The Board of Water and Air Resources, by virtue of its responsibility to review development plans, coordinate with other State agencies and local interests, and to formulate a proposed position for the Governor, cannot unequivocally endorse these projects until a suitable opportunity has been provided to review the reports in accordance with existing procedures. Consequently, the exact nature of the State's position is as yet undetermined.

The Department of Water and Air Resources has considered the possible future benefits of a large source of water for community and industrial benefits and has provided assurances to the District Engineer that, if the dam is built, North Carolina agencies will ultimately utilize by 2020 from 300 to 350 millions of gallons daily.

Cape Fear River Basin

The extent of the Cape Fear River Basin in Appalachia is not over 10 to 15 square miles, if that much. It is an area which may be absorbed into Winston-Salem by the year 2020 and no specific water development programs are presently indicated.

Catawba River Basin

The Catawba River Basin in North Carolina totals 3,253 sq. mi. of which 1,484 sq. mi. is in Appalachia. Together with the Broad River Basin, the Catawba River Basin comprises part of the Santee River Basin, which is shared with South Carolina. The present population in the Catawba Basin (Appalachian portion as of 1960) is estimated at 137,000. The major portion of the Basin is in the Alexander-Burke-Caldwell LDD, but smaller portions are in the Isothermal and Mountain Scenic LDDs.

The thrust of economic growth is identified as primarily along Interstate Highway No. 40 from Morganton eastward, secondarily along U.S. Highway No. 321 from Lenoir southeastward to Granite Falls, and in a scattered way along State Highway No. 90 from Taylorsville west. In general, growth is expected to occur in these areas and near towns identified as secondary growth centers or urban centers, no primary growth centers being located in the river basin area. These are

Morganton, Lenoir, Valdese, Granite Falls, and Hudson. All of this growth is in the A-B-C LDD.

A medium thrust of economic growth is along Interstate Highway 40 from Old Fort to West Marion. Growth is expected to occur significantly at Marion and West Marion, a secondary growth area, and at Old Fort, an urban center. These areas are in the Isothermal LDD.

There are no selected growth areas in the portion of the watershed located in the Mountain Scenic LDD.

Most water resource development projects would be expected to serve or stimulate the areas defined; to contribute to attainment of minimum essential standards elsewhere as well; and to serve other purposes of state-wide or interstate value.

The average annual yield of surface water is approximated at 1,655,000 acre-feet. Ground water is obtainable in sizeable quantities if good exploratory and development practice is followed. Water quality of the main stream is generally suitable for public water supply.

Four major projects of the Duke Power Company exist on the main stream. These have a gross storage of over 500,000 acre-feet and a full pool area of over 15,000 acres. At least eight other projects of lesser importance, owned by Duke and others, are in the area. One P.L. 566 project (Muddy Creek) is under construction. This project (estimated total cost of \$1,376,548), involves nine storage impoundments totalling almost 6,000 acre-feet in capacity. The Catawba River Basin has long been looked upon as a model of efficient and optimum development for the single purpose of power. Other purposes have, of course, become important, such as recreation and public water supply.

Based on the available information, the total 1966 water use (exclusive of hydro-electric power generation and similar uses), appears to be on the order of 28,000 acre-feet or 25.0 MGD.

The principal planning now underway is that described under the Broad River Basin heading. County-wide water and sewerage studies are pending for all counties but McDowell. The Rummel, Klepper, and Kahl water and sewerage needs study covers portions of the Interstate 40 Corridor.

The principal problems involved in further water resource development of this basin relate to the relatively intensive economic development and the waste handling needs accompanying this development. A major constraint is the existence of the Duke Power Company system which necessarily conditions the general scope of further development.

The projected agricultural water demand for the year 2020 (in this case, including rural domestic, cattle watering, and irrigation), is

tentatively 49,000 acre-feet. The urban water use, including a medium level of connected industrial use, is projected as 31,000 acre-feet. Self-supplied industrial use could range from 7,000 to 35,000 acre-feet. Flood control needs have not been established specifically, but it is unlikely that major flood control structures will be required aside from those in the P.L. 566 program. Flood plain management to include zoning will be required at all major urban areas. The use and need for power is expected to increase rapidly in keeping with regional trends, but the specific basis, if any, for additional steam or hydro facilities is not known to the Water and Air Resources Department at this time. There is no current evidence to support navigational development, other than recreational, at this time. A major need for additional recreational facilities is foreseen, but definitive information must await further development of the North Carolina Recreation Plan.

Much progress has been made in the Appalachian Region, as well as in the Basin as a whole, in abating pollution since the issuance of the Comprehensive Pollution Abatement Plan. There are presently within this Region 32 significant sources of waste discharge which are the responsibility of both municipalities and industry. Of these, 23 or 72 percent, have provided adequate waste treatment facilities in keeping with the requirements of stream usage. There are within the Region three municipalities which have constructed adequate waste treatment facilities at a cost of \$2,281,000. There are six municipalities and three industries which do not, at the present time, provide adequate treatment for their wastes but which are making satisfactory progress toward providing the needed facilities. While the cost of the required industrial facilities is not presently known, those for the municipalities have an estimated cost of \$5,752,500. In addition, there are 18 small communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to imply that sewage collection and treatment facilities are needed for all of these communities, such facilities are needed in many instances to prevent public health nuisances and potential health hazards, as well as to provide an opportunity for economic development. The facilities considered adequate to serve these needs have an estimated cost of \$5,553,000.

Marked improvement in water quality has occurred in the receiving streams where the municipalities and industries have met their responsibilities, and it is anticipated that when all have constructed the necessary facilities, the receiving waters will be protected in keeping with their assigned classification. It is not feasible at this time to project requirements for pollution abatement to the year 2020. It is quite likely that future requirements will need not only waste treatment facilities to meet the demands of population and industrial growth, but storage for dilution purposes at various locations as well.

Wildlife needs will become more demanding as urban encroachment continues. The following "best" fishing streams will require continuing measures to keep them that way:

Jacobs Fork
Jarretts Creek
Linville River
Lost Cove Creek
Steels Creek
Upper Creek

Burke County
McDowell County
Burke County
Avery County
Burke County
Burke County

It is concluded that, at present, the proper course of action is to continue existing studies and to expand collection of information on resources, assets, problems, and needs looking to development of the Catawba River Basin portion of the North Carolina Water Plan.

French Broad River Basin

The French Broad River Basin in North Carolina is actually three separate watersheds within North Carolina. This summary is concerned with the French Broad proper with the Nolichucky and Pigeon being treated separately. The drainage area in North Carolina, all in Appalachia, is approximately 1,664 sq.mi. The Basin is entirely within the Upper French Broad LDD. The estimated population in the Basin (1960 Census) - 192,000.

The thrust of economic growth is described as major along Interstate Highway I-26 from Asheville to Hendersonville and as medium from Asheville along Interstate Highway I-40 west toward Canton (on the watershed boundary). A medium thrust of development is defined along U.S. Highway 64 from Hendersonville to Brevard. A scattered growth is shown as developing northward from Asheville along U.S. Highways 19 and 23 towards Mars Hill. Asheville is the primary growth center, **Brevard and Hendersonville are the secondary growth centers and Black Mountain is an urban center.**

The average annual yield of surface water is approximated as 1,982,000 acre-feet annually. At Asheville, the yield is 1,492,000 acre-feet. Water quality has been greatly improved through the recent construction of wastewater collection and treatment facilities on the main stem and tributaries. Ground water availability in quantitative terms has not been established in the same manner as surface water. It is heavily used in the rural areas and relatively large quantities can be developed at reasonable cost.

There are a number of medium-sized impoundments in the river basin, mostly for water supply and recreation purposes. There are no significant structures on the main stem of the river (notwithstanding certain obsolescent low head dams below Asheville). Six of the existing dams are of considerable height. There are 24 significant communities in the area which account for 92,000 population or more than 40 percent of those in the Basin. Apparently, about ten of the communities have public water systems, some of which also supply adjoining communities.

As noted previously, the quality of the surface waters of this Basin, which lies wholly within the Appalachian Region, has been greatly improved due to the recent construction of wastewater collection and treatment facilities on the main stem and tributaries thereto. There are presently within the basin 19 significant sources of waste discharge which are the responsibility of both municipalities and industries. Of these, 19 or 72 percent have provided adequate waste treatment facilities in keeping with the requirements of the essential uses made of the streams. The Metropolitan Sewerage District of Buncombe County, which serves four municipalities, and several sanitary districts or similar districts and three municipalities, has constructed adequate wastewater treatment facilities at a cost of \$11,319,000. There are two municipalities and three industries which do not, at the present time, provide adequate treatment for their wastes, but which are making satisfactory progress toward providing the needed facilities. While the cost of the required industrial facilities is not presently known, those for the municipalities have an estimated cost of \$543,800. In addition, there are 17 small communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to imply that sewage collection and treatment facilities are needed for all of these communities, such facilities are needed in many instances to prevent public health nuisances and potential health hazards, as well as to provide an opportunity for economic development. The facilities considered adequate to serve those needs have an estimated cost of \$3,965,000.

It is anticipated that when all of the required wastewater treatment facilities have been constructed, the receiving waters will be protected in keeping with their assigned classification. While it is not feasible at this time to project requirements for pollution abatement to the year 2020, the Tennessee Valley Authority planning contemplates a need for as much as 76,900 acre-feet of water in a year for purposes of dilution in support of water quality by the year 2020.

An attempt has been made to estimate current water use on the same basis as used by the N.C. Board of Water Commissioners for 1956. The estimate includes domestic use, rural and urban, as 14,000 acre-feet; industrial use, self-supplied and as part of community system use, 62,000 acre-feet; and agricultural, irrigation and cattle watering, 17,000 acre-feet for a total of 93,000 acre-feet. This would average about 83 MGD. Excluded are certain uses such as hydro-electric power development, major thermal plant cooling uses, etc.

The principal water resources planning now in progress is that by the Tennessee Valley Authority, which is also responsible for its region in the Appalachian Water Resources Survey. The SCS activity has been high but no P.L. 566 projects are now actually known to be in active status. A county-wide water and sewerage plan for Henderson County is pending and the Rummel, Klepper and Kahl study includes certain highway corridor areas. The North Carolina Water Plan section devoted to the French Broad is in the very initial stages.

The principal problems involved in further water resources development of this river basin, not necessarily in the order of importance, have to do with protection from destructive floods, completion of proposed waste treatment facilities and maintenance of water quality standards that will contribute to growth and well-being, provision of major water-based recreation facilities to balance the outstanding scenic and wildlife attractiveness of the area, **and** provision of industrial and community water supply to support planned growth.

The projected agricultural water demand for the year 2020, composed of irrigation and cattle watering, is generally estimated at 20,000 acre-feet. The urban and rural use, including a reasonable industrial component to the urban use projected to the year 2020 may reach from 53,000 to 71,000 acre-feet. Current self-supplied industrial use is about 46,000 acre-feet. The Tennessee Valley Authority has identified numerous industrial sites that are water related which could entail several times the 46,000 acre-feet as a potential use. At present, it seems prudent to project no more than 92,000 acre-feet by 2020, in view of extremely difficult stream quality control problems that would probably be associated. The TVA planning contemplates a need for as much as 76,900 acre-feet of stored water **in** a year for purposes of dilution of treated wastes in support of water quality and this figure may be acceptable in terms of the year 2020, as indicated previously. The quantities described add up to a maximum of 260,000 acre-feet which would represent an average daily flow of about 232 million gallons.

There is a major flood management requirement that will require structural measures as well as other flood plain management measures. The average annual damage to urban areas is estimated at \$1,600,000 and potential agricultural damage is very great. The TVA has prepared flood plain reports of most of the critical urban areas which provide the information for local governments to pursue the necessary non-structural measures. The continued growth in power demand consistent with the southeastern region can be met from system growth of the serving utilities. Further hydro-electric development sites do not appear to be sufficiently enticing to warrant major new construction in the Basin for that purpose. There is a very large future demand for expansion of outdoor recreation facilities which cannot be expressed in concrete terms until the North Carolina Recreation Plan is further advanced. There is no water transportation requirement known to exist, nor does a waterway appear feasible.

Preservation of wildlife - particularly fishery - **assets** is a major need in this Basin. The 1968 designated public mountain trout waters totals 125 miles of flowing stream and 50 acres of impoundment. Ten of the better sport fishing streams in the Basin are listed in the following as set forth by the North Carolina Wildlife Resources Commission. Obviously, long range planning must aim to protect these streams, specifically as much as possible and to add to them as feasible:

Davidson River
South Mills River
Little River

West Fork, French Broad River
North Fork, French Broad River
Dillingham Creek
Big Laurel Creek

Cathey Creek
Spring Creek
Shelton Creek

The TVA has proposed a definite plan of water resource development in the Upper French Broad Basin. This plan consists of 14 impoundments on tributaries of the French Broad River, 58 miles of channel enlargements, 16 miles of bank clearing and a 1.4 mile levee along the Asheville water front. The system is a multiple-purpose system entailing total storage in the "wet" dams of 173,200 acre-feet and a corresponding total pool area of 6,755 acres. All of the dams have a flood control purpose, 11 have recreation for a purpose, ten have water quality control for a purpose, and six have water supply for a purpose.

The plan provides 24,500 acre-feet of water supply storage; 76,900 acre-feet of water quality control storage; and a variable amount of controlled flood storage depending on circumstances but never less than 89,300 acre-feet. The acreage of recreation pool at 11 projects will total 6,050 with 156 miles of shoreline. Controlled drawdown will assure optimum recreation attractiveness. The plan has been coordinated with the Wildlife Resources Commission and the TVA has incorporated in its plans specific actions in support of 17 recommendations by the Commission.

The estimated total cost of the project, exclusive of interest during construction, is presently \$96,000,000. The estimated benefit-cost ratio of the project is 1.4. The State Planning Task Force has made an associated study of development investments that should be made in connection with the projects and has listed the following probable totals:

Federal	\$ 100,000
State	14,350,500
Local	7,142,800
Quasi-Public	702,500
Private	<u>177,723,000</u>

\$200,018,000

The State of North Carolina has participated in the preparation of the TVA plan and it has been formally endorsed by the Governor in a letter dated November 30, 1966. Continued engineering studies looking to the earliest feasible start of construction have been authorized and financed by Federal appropriation.

Continuing state action and coordination is required in furtherance of the project. It should be noted that the French Broad River has previously been identified by the Board of Water Resources as being a river basin that might be approaching capacity use. It is important that the North Carolina Water Plan for this Basin be prepared as soon as

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possible to identify all the State needs and action measures that will be required in furtherance of this plan, as well as other State programs not covered within the TVA plan.

Hiwassee River Basin

The Hiwassee River Basin in North Carolina totals 643 square miles and is entirely in Appalachia. It is generally downstream from that portion of the watershed in Georgia and upstream from that portion in Tennessee. A small 18-square mile area in the southwest corner of Cherokee County drains into the Toccoa River and is distinct from the Hiwassee Basin in North Carolina. However, this consideration is being ignored in this report. The present population in the Basin (1960 Census) is estimated at 20,700. The entire North Carolina area is in the Southwestern LDD.

A thrust of economic development of medium intensity extends between Murphy and Andrews. Murphy is identified as a secondary growth center, while Andrews and Hayesville are classed as urban centers. The relative relationship and interdependence of the North Carolina and Georgia areas suggests that economic development may best be undertaken as a joint interstate cooperative venture. The Upper Hiwassee Watershed Development Association has been formed and is composed of representatives from the two North Carolina and three Georgia counties.

The average annual yield of surface water in North Carolina is approximated as 1,446,000 acre-feet (ignoring the Toccoa drainage). Ground water is extensively used for rural supplies and some other purposes, but it is impracticable to express an average annual yield capability in similar terms to surface water yield. Ground water is obtainable in sizable quantities if good exploratory and development practice is followed. Water quality of the main surface stream (Hiwassee River) is being maintained in keeping with the assigned classifications of A-II above the Murphy water intake and near Hiwassee Dam and those segments classified B and C elsewhere. The quality of the tributaries is generally good to excellent.

Three major dams of the TVA are in the Basin (Appalachia, Hiwassee, and Chatuge). Together, they have a gross storage capacity of 743,700 acre-feet and 14,078 acres of water surface. A large part of Chatuge Lake included in these totals is in Georgia. There are at least three other significant minor impoundments in the Basin. Three community water and waste systems are known to be in existence.

Existing community water use (including minor included industrial use), is about 800 acre-feet. Rural domestic use is estimated at 1,130 acre-feet. Self-supplied industrial use is probably not much more than 50 acre-feet. Irrigation and cattle watering is estimated at 300 acre-feet. This totals to a current probable use of less than 2,300 acre-feet, which is easily supplied by the resources available.

The major planning activity now going on is in connection with the TVA Tributary Area Development program. The Authority, in conjunction with the Upper Hiwassee Development Association is continuing the study of this area, seeking various means of economic betterment. The SCS is actively engaged in planning P.L. 566 projects and both counties have sponsored county-wide water and sewerage studies under the FHA program. The Hiwassee River Basin section of the North Carolina Water Plan by the Department of Water and Air Resources is scheduled. The Rummel, Klepper, and Kahl Water and Sewerage Development Study sponsored by the State Planning Officer includes detailed analysis of the Murphy-Andrews Corridor.

Water resources in themselves provide no real constraint to the development of this area. The relative isolation, mountainous terrain, large public ownership by the Federal government, the need to preserve scenic and wildlife resources, and the sparse existing population, in combination, undoubtedly will have far more to do with the future potential for development.

The projection of water needs to the year 2020 contemplates a total rural use of 5,300 acre-feet composed of 1,800 domestic; 500 stock watering; and 3,000 irrigation. Urban community use, including connected industrial loads, total 3,600 acre-feet. Self-supplied industrial use could be between 1,300 and 8,000 acre-feet. Altogether, this would amount to a possible use between 10,200 and 16,900 acre-feet, or a maximum of 15 MGD on the average. The Rummel, Klepper, and Kahl study indicates a possible usage of 2.8 MGD in the Murphy-Andrews Corridor.

No major flood control structures appear to be indicated, although the P.L. 566 projects will need to include provisions to ameliorate agricultural flooding. No major new power projects appear to be required. A navigation development is not presently foreseen as either required or feasible, although a waterway connection between the Tennessee River and the Savannah River has been envisioned speculatively. A major increase in recreation demand is forecast, but more definitive information is not available at this stage.

As noted above, the quality of the surface waters of this Basin, which lies wholly within the Appalachia Region, is generally good to excellent. There are no significant sources of waste discharges from industries within this Basin, and only three municipalities presently have waste collection systems. Two municipalities have provided adequate wastewater treatment facilities, Murphy and Hayesville, having an estimated cost of \$506,600. The Town of Andrews is planning to construct a new wastewater collection system and add secondary units to its existing primary wastewater treatment plant. A Federal grant has been received in the amount of \$28,500 under the provisions of the Appalachian Regional Development Act for the required project, which has an estimated cost of \$95,000. When these facilities are constructed in the near future, it is anticipated that all of the waters of this Basin will be

protected in keeping with their assigned water quality standards. Note is made that the TVA has recently constructed adequate wastewater treatment facilities at the Hiwassee Dam, while the Hiwassee Resort Village, Inc. has removed the former inadequately treated wastes from the river by constructing septic tanks and subsurface disposal works at the various installations. In addition to the above, two small communities, Marble and Texana, should give consideration to constructing adequate wastewater collection and treatment facilities in order to prevent possible public health nuisances and potential health hazards and to encourage economic development in their respective areas. Such facilities are estimated to cost approximately \$400,000.

While it is not practicable to project future construction of wastewater treatment facilities to the year 2020 at this time, it is believed that there will be no need for providing storage of dilution water for the maintenance of water quality prior to 2020.

The Wildlife Resources Commission has identified the following as best fishing streams:

Tuni Creek	Rock Hill Creek
Little Fires Creek	Tusquitee Creek
Valley River	Hiwassee River
Fires Creek	Eagle Fork Creek

Continuing efforts will be needed to preserve and expand these facilities and a special effort is warranted to develop the potential trout fishing capability of the inter-dam reach of the Hiwassee River.

It is concluded that, for the present, the best course of action is to continue existing and undertake needed studies looking to completion of the Hiwassee River Basin section of the North Carolina Water Plan as soon as reasonably possible.

Little Tennessee River Basin

The Little Tennessee River Basin in North Carolina totals 1,787 square miles and is entirely in Appalachia. It is downstream from a very small portion of the Basin in Georgia, and upstream from that portion in Tennessee. A very small area in southwest Graham County drains into the Tellico River and is independent of the remainder of the Little Tennessee Basin in North Carolina. The consideration of this area is being ignored in this report. The present population in the Basin (1960 Census) is estimated at 48,000. The entire North Carolina portion is in the Southwestern Local Development District.

No unusual economic development growth tendencies have been identified, but the Town of Sylva is defined as a secondary growth center, with Bryson City and Franklin classified as urban centers.

The average annual yield of surface water in North Carolina is approximated as 2,733,000 acre-feet (ignoring the Tellico drainage). Ground water is used extensively for rural supplies and some other purposes, but it is impracticable to express an average annual yield capability in similar terms to surface water yield. Ground water is obtainable in sizable quantities if good exploratory and development practice is followed. Water quality of the main stream based on the stream classification is relatively high. Ground water is of good quality.

Eight major impoundments and at least seven more of lesser importance now exist in the Basin. Fontana Dam is the highest dam east of the Mississippi (480 feet), impounds 1,444,300 acre-feet, and has a corresponding surface area of 10,670 acres. The major dams owned by the Aluminum Company of America, or its subdivisions and operationally supervised by TVA aggregate 448,000 acre-feet capacity with a corresponding acreage of 7,300. Five of the eight significant communities have public water supplies.

There are presently within this Basin 13 significant sources of waste discharge which are the responsibility of both municipalities and industries. Of these, 9 or 62 percent, have provided adequate waste treatment facilities in keeping with the requirements of the essential uses made of the streams. Three of the municipalities and the Cherokee Indian Reservation have provided adequate waste treatment facilities at an estimated cost of \$1,113,095. There are three municipalities and one industry which have not, at the present time, provided adequate treatment for their wastes. While the three municipalities, which have no treatment facilities at all, are making satisfactory progress in abating pollution, the one industry - a mining operation, is not making satisfactory progress in meeting its responsibilities at this time. While settling facilities have been provided at this industry, they are presently inadequate and every effort will be made to assure early construction of adequate facilities. Although the cost of abating this pollution is not presently known, the facilities under construction or proposed for construction by the municipalities have an estimated cost of \$751,950. In addition, there are ten small communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to imply that sewage collection and treatment facilities are needed for all of these communities, such facilities are needed in a number of instances to prevent public health nuisances and potential health hazards, as well as to provide an opportunity for economic development. The facilities considered adequate to serve these needs have an estimated cost of \$2,101,500. The TVA has now provided adequate waste treatment facilities at Fontana Dam and the swimming pool area at Fontana Village. The need for secondary treatment and chlorination facilities is presently under investigation at the main waste treatment plant for the Village.

When those who are presently discharging inadequately treated wastes, or wastes without any treatment at all, have fulfilled their responsibilities, it is anticipated that the waters of this Basin will be protected in keeping with their assigned water quality standards. Studies will be made, however, to see if the facilities, as constructed, are actually providing the protection to the streams for which they were designed. It is not practicable at this time to forecast waste treatment needs to the year 2020; however, it is believed that storage for water quality control will probably not be required, except possibly in the Tuckasegee River Drainage Area, where there is presently undesirable disruption to natural streamflow due to hydroelectric power development.

The extent of existing use is relatively uncertain. A current estimate of urban use with connected industry load is about 1,700 acre-feet. Domestic rural use is estimated at 2,000 acre-feet. It does not appear that current irrigation use could exceed 4,000 acre-feet, or cattle watering 300 acre-feet. Current industrial use is negligible except for the paper mill in Jackson County. Total industrial use may be 4,700 acre-feet. The entire use adds up to 12,400 acre-feet or an average of 11 million gallons per day.

The most significant study now in progress is the TVA investigation under the Tributary Area Development program. This study is in the early stages and is being carried on in cooperation with the Twin-State Development Association. The SCS has been actively studying two P.L. 566 projects and a third may be dormant. A water supply storage for community and industrial use is being planned as part of the Tallulah Creek Watershed. The North Carolina Water Plan section for the Little Tennessee River has been scheduled but no start has been made. County-wide water and sewerage studies under the FHA program are under way or being sought for all but Swain County. The TVA has scheduled a flood plain study for the City of Robbinsville.

No constraints related to water quantity appear to exist in this Basin. Economic development will hinge more on other factors, such as sparse population, mountainous terrain, high level of Federal ownership, and the like. The Basin is very highly developed by major impoundments which limits both the degree and nature of future measures.

Water requirements in the year 2020 for rural domestic purposes is estimated at 3,700 acre-feet. A high estimate for irrigation is 7,000 and a generous estimate for cattle watering is 700. Urban water use, including connected industry, is projected as 8,000 acre-feet. Self-supplied industry is estimated by doubling the approximate present use to 9,500 acre-feet. All of these requirements total 28,900 acre-feet, representing an average flow of 25.8 MGD.

There is an apparent serious need for comprehensive flood plain management to include both structural and non-structural means. Agriculture flood protection is an important part of this need. Remaining

facilities for power production are probably of minor importance and the growth of power demand should be met by normal expansion of serving utilities. There is no apparent requirement for, or economical basis, to justify commercial waterway development, despite the speculation mentioned in the Hiwassee section about a connection between the Tennessee and the Savannah.

There is a major requirement for recreational facilities, but quantitative definition of these requirements must await further development of the North Carolina Recreation Plan.

The Wildlife Resources Commission has suggested various actions to improve the fishery in this region. Economic development sought under the Appalachian program will, if it materializes, necessitate close and continuing attention to maintenance of wildlife assets.

As part of the Appalachian Water Resources Survey, a feasibility report has been issued on the Tallulah Creek Watershed. One multiple-purpose impoundment and seven floodwater retarding structures have been considered and a project plan to meet identified needs has been developed with an estimated cost of \$3,385,000. On the same general plan with development expanded to the full potential, the cost estimate is \$4,860,000. Further action by the Board of Water and Air Resources must be deferred until a work plan is prepared and recommendations by the local organization and SCS presented to the Board for consideration.

It is concluded that the most significant recommendation than can be made at this time is one to continue and expedite the various studies and analyses looking to early adoption of a comprehensive plan. The Head of Little Tennessee Watershed Work Plan has been approved by the State of North Carolina and it becomes an integral existing feature of the State Water Plan. However, this project is primarily in Georgia and has little effect in North Carolina.

New River Basin (Kanawha)

The New River Basin in North Carolina totals 768 square miles in area and is entirely in Appalachia. The present population in the Basin (1960 Census) is about 33,000. The Basin is primarily in the Blue Ridge LDD, but the important area around Boone in Watauga County is in the Mountain Scenic LDD.

There is no significant economic growth trend, such as is occurring along interstate highways, but the Town of Boone is identified as a secondary growth area.

The average annual yield of surface water theoretically useable in North Carolina is about 1,000,000 acre-feet. Ground water is used extensively, but it is impracticable to express an average annual yield

capability in similar terms to surface water yield. Ground water is obtainable in sizeable quantities if good exploratory and development practice is followed. Water quality, based upon stream classifications, is good, except in those instances where adequate waste treatment facilities have not, as yet, been provided.

There are no existing impoundments of significant importance. Six significant towns in the area have public water systems. Five have waste systems in being, under construction, or pending.

There are presently within this Basin nine significant sources of waste discharge which are the responsibility of both municipalities and industry. Of these, five or 56 percent have provided adequate waste treatment facilities in keeping with the requirement of the essential uses made of the streams. Three of the municipalities have provided adequate waste treatment facilities at an estimated cost of \$771,540. There are two municipalities and one industry which have not, at the present time, provided adequate treatment for their wastes. While the municipalities, which provide either inadequate treatment or no treatment at all, are making satisfactory progress in abating its pollution, the one industry is not making satisfactory progress in abating its pollution at this time. Every effort will be made, however, to see that this industry provides early construction of the necessary waste treatment facilities. While the cost for abating this pollution is not presently known, the facilities under construction or proposed for construction by the municipalities, have an estimated cost of \$2,337,240. In addition, there are four small communities having a population of 200 or more that presently do not provide sewer services. These communities, in the interest of preventing possible public health nuisances and potential health hazards and in order to encourage economic development, should give consideration to providing sewage collection and waste treatment facilities. The facilities considered adequate to serve these needs have an estimated cost of \$762,500.

When the above-mentioned municipalities and the one industry have fulfilled their responsibilities, it is anticipated that the water of this Basin will be protected in keeping with their assigned water quality standards.

The existing water use is estimated as 900 acre-feet for community supplies, including connected industry; 50 acre-feet for self-supplied industry; 2,100 acre-feet for rural domestic; 900 acre-feet for cattle watering; and 300 acre-feet for irrigation, for a total of 4,250 acre-feet averaging 3.8 MGD.

Major and intensive water resource planning is now going on in this Basin. The most important study projects are the Type II Comprehensive Survey of the Kanawha River Basin by the Corps of Engineers and the privately financed power study being made by the Appalachian Power Company. A comprehensive county-wide water and sewerage plan is being prepared

for Ashe County, and Allegheny County is seeking such a study. The Rummel, Klepper and Kahl Study sponsored by the State Planning Officer includes an analysis of the Boone area. The North Carolina Water Plan Study, New River section, is scheduled but no work has been undertaken. The State of Virginia has just completed a thorough study and prepared a plan for its portion of the New River Basin. The Virginia and North Carolina studies are to be correlated at a later date.

There is an ample supply of water for use within the Basin in North Carolina. More significant for development are the implications of sparse population, relatively mountainous terrain, the high interest in preserving the trout fisheries, and poor highway communications. A major constraint lies in the fact that the benefits of large impoundments in North Carolina are predicated on the needs of downstream areas out of the State entailing a design that is optimum for those purposes, but not optimum in terms of interests within North Carolina. The balancing of these conflicting considerations is a major problem.

Water requirements in the year 2020 for rural domestic purposes is estimated at 3,800 acre-feet; irrigation use is estimated at 7,000 acre-feet; and cattle watering use is estimated at 1,800 acre-feet. Community water supply requirements including the connected industrial load is estimated at 8,500 acre-feet for the year 2020. A self-supplied industrial use for that year is at least potentially 5,500 acre-feet. These projections total 26,600 acre-feet, equivalent to an average of 23.8 MGD.

At the present time, there is no major need for flood control structures known, but the development of the area to the extent estimated will require flood plain management positively calling for non-structural measures and probably calling for some structures. Power demand growth expected can be met from expanded facilities of the utilities now serving the area. There is an important flood control storage requirement expressed for meeting out-of-State needs. The Basin has a major hydro-electric power production capability, a fact which is key to the current planning problem. Navigation facilities, other than recreational, are of negligible significance, nor would a waterway be practicable in the headwaters of the New River. A major unsatisfied recreational need will surely develop prior to the year 2020, but the definition and scope of this need must await completion of appropriate sections of the North Carolina Recreation Plan.

A major storage requirement for dilution of downstream wastes has been expressed to meet water quality requirements, the amount ranging from 500,000 to 650,000 acre-feet. Storage for water quality dilution use within North Carolina may be required for Buffalo Creek below West Jefferson by the year 2020 (based on FWPCA estimates). The availability of such storage has not been established. The necessary waste treatment facilities to support the postulated economic growth in the Basin cannot be estimated at this time. However, there is an existing need for new waste treatment facilities in Ashe County totalling almost \$800,000.

The Wildlife Resources Commission has recommended action to enhance the following streams defined as essential to the trout fishery:

- 1) Three Top Creek, and all its tributaries
- 2) Little River and all tributaries above Sparta Mill Pond
- 3) Brush Creek and all its tributaries
- 4) Big Glade Creek and all its tributaries
- 5) Hoskins Fork and all its tributaries
- 6) Winkler Creek and all its tributaries
- 7) Middle Fork and all its tributaries

The Commission has shown that pollution, the existing stream classifications, agricultural and land-use practices, have already combined to destroy good trout habitat. In view of projected growth and proposed major reservoir construction, the needs for protecting, replacing, or developing fishery resources will require major planning efforts and probably significant expenditures. It should be noted, however, that all of the above streams have not been designated for protection as "trout waters" by the Board of Water and Air Resources for sound reasons and this must be given due consideration in future planning.

As far as the water resources needs of the North Carolina portion of the New River Basin are concerned, the solutions are relatively simple, though not so easy to carry out. The water supply and distribution systems need improvement and expansion to serve present needs, and to encourage economic development. As noted previously, steps are underway to provide the needed waste treatment facilities where they are presently inadequate. These and the waste treatment facilities already provided have been designated to provide for reasonable expansion and growth. The trout streams need to be preserved and improved, while at the same time, there is a need for recreation lake facilities. There is a major power, flood control, and water quality control need downstream which may require projects in North Carolina to satisfy them.

The last major study of the Kanawha River Basin prior to the one now underway was incorporated in House Document No. 91, 74th Congress, First Session, February, 1935. The Moores Ferry Site at mile 217.4 on the New River was chosen as a key feature of the **Comprehensive Flood Control Plan** authorized by the Congress. Developments at this site plus two in North Carolina, identified as Site No. 78 (near Glendale Springs) and Site No. 82 (downstream near the junction of the North and South Forks of the New River) are the principal sites under consideration by the Corps of Engineers.

However, the development which has thus far received North Carolina endorsement is one proposed by the Appalachian Power Company and identified as the Blue Ridge Project. The Company obtained a preliminary permit from the FPC March 11, 1963. On February 26, 1965, the Company filed application for license entailing a two-dam project, the upper dam being the one which would affect North Carolina. Its characteristics were as follows:

Location:	On New River about 0.5 mile upstream from the mouth of Rock Creek and four miles downstream from the mouth of Little River (essentially, the same as Moore's Ferry Site).
Type:	Compacted rock fill
Normal Maximum	
Power Pool:	El. 2,486.7
Top of Dam:	El. 2,507
River Bed Elevation	El. 2,240
Length along Centerline	2,000 feet
Top of Spillway Gates	El. 2,497
Spillway Design	
Flood Pool	El. 2,497 - 16,600 acres
Storage Capacity	El. 2,497 - 1,288,000 acre-feet
Controlled Flood Storage	El. 2,486.7 - El. 2,497; 160,000 acre-feet
Low Flow Supplementation	25,000 acre-feet

The cost of the upper Project was estimated at \$73,800,000 and construction would probably have been completed during 1970 had the license been granted in 1965.

Following is a limited description of the two sites in North Carolina which still have a possibility of selection:

Site No. 82

Location:	New River at the forks in North Carolina. 1.9 miles below the confluence of the North and South Forks.
Potential Purposes:	Flood Control, Power, Water Quality Control, Recreation, and Fish and Wildlife Enhancement.
Drainage Area Controlled:	628 square miles
Dam:	Rock fill, 225-255 feet high
Minimum Probable Pool:	El. 2,640; 422,000 acre-feet; 7,470 acres; 41.5 miles long
Maximum Probable Pool:	El. 2,670, 696,000 acre-feet, 10,888 acres; 47.5 miles long

Site No. 78

Location:	South Fork near Glendale Springs.
Drainage Area Controlled:	200 square miles
Minimum Probable Storage:	96,300 acre-feet
Maximum Probable Storage:	329,200 acre-feet

In general, the Appalachian Power Company project, as originally proposed, has been considered as acceptable and desirable in terms of North Carolina interests, with North Carolina benefits related to recreational potential, minimum detriment to fishing resources, and a possibility for water supply benefits. However, the original Company plan was not altogether acceptable to the REA interests, the Department of Interior, and the Corps of Engineers for varying reasons.

The major interests of the Federal objections to the original application of the Appalachian Power Company have been those of the Department of the Interior and a series of proposals and counter proposals have been made, hearings held, and further alternatives introduced leading to more studies and more hearings. The State of North Carolina did not participate formally in the early stages because its position was generally favorable to the Company plan. Eventually, it became necessary to enter into the proceedings in a more formal way and a letter to the Secretary, Federal Power Commission, from the Director, Department of Administration, dated December 29, 1966, constituted the first major official action by the State following the Department of Water and Air Resources letter of May 14, 1965. Portions of the later letter are quoted:

" . . . this hearing related to an intervention by the Secretary of the Interior, and that he is asking that the applicant be required to provide more adequate public access and facilities for recreation, and to reserve a greatly increased amount of storage to provide flows to improve water quality in the Kanawha River below Charleston, West Virginia.

" . . . operation to provide the increased water quality flows desired by the Secretary of the Interior would result in a maximum fluctuation of 27 feet during the recreation season under the most adverse conditions, and 43 feet outside of the recreation season. This would have unacceptably detrimental effects on recreation and fish and wildlife in North Carolina . . . we respectfully request the Commissioner's approval . . . to appear or testify . . . for the State . . .

"The general substance of the testimony . . . is that increased storage and flows as proposed for water quality control will have detrimental effects on recreation and fish and wildlife in North Carolina; that the amount of such storage is disproportionally large compared to that in other reservoirs in the Basin which affect flows in the Kanawha River; and that no flows for pollution dilution should be required until every polluter has installed at least secondary waste treatment, which is not presently the case."

After various discussions among those interest in protecting State of North Carolina interests, it was decided to take a stronger position than that of December 29, 1966, and the Governor, on April 17, 1967,

directed the Attorney-General to take the necessary legal steps to cause the State of North Carolina to become a party in the case pending. A Petition to Intervene was filed with FPC on April 21. The FPC, on May 8, 1967, issued an order permitting the State of North Carolina to intervene.

In June of 1967, the Assistant Secretary of the Interior advised Senator Jordan that the Department must hold to the requirement of 500,000 acre-feet of water quality storage at the Upper Blue Ridge Reservoir, even if it did adversely affect recreation in North Carolina and cited harm that would occur to "downstream" recreation as well as the water quality control needs.

In August, 1967, the Department of the Interior, as part of its continued study, expressed a need for 650,000 acre-feet of dilution storage from the upper New River, of which 350,000 would come from the upper Reservoir, 50,000 from the lower Reservoir, and 250,000 would come from Site 82.

Later in September, 1967, as various alternative proposals were considered, the Director, North Carolina Recreation Commission, rather firmly stated that provision of two constant level sub-impoundments in North Carolina would be acceptable only in conjunction with a maximum 10-foot drawdown of the upper lake.

On October 9, 1967, the FPC announced that its staff was studying an alternative two-dam proposal entailing a lower dam four miles west of Galax, Virginia, and an upper dam five miles southwest of Independence. At the time of this writing the Appalachian Power Company was making an intensive study of the two-dam staff project.

To sum up the situation at this point, there is for consideration the original proposal by the Appalachian Power Company, which is acceptable to the State of North Carolina, subject to refinements and adjustments, within the general scope of the proposal. This could entail possible increase of low flow augmentation storage to 175,000 acre-feet. The staff proposal (FPC staff) appears to involve two dams differently located than as proposed by the Company, with the upper reservoir backing water to the Sprague Electric Company plant near Lansing. Other major alternatives appear to provide projects similar to the Company proposal with an additional project at Site No. 82, and with major changes in drawdown. Finally, there are innumerable combinations and permutations involving pumped storage at different points.

It is probably that strong North Carolina opposition would develop, particularly from the wildlife interests, to flooding of trout streams much beyond that envisioned in the original Company project. However, there is also likely to be strong local support to a relatively constant level impoundment at Site No. 78.

The issues are complex and determination of an ultimate State of North Carolina position depends upon analysis of the proposals already made plus those to be made. It is observed that the Department of the Interior considers that the headwaters area should contribute at least 650,000 acre-feet to the over-all basin water quality objectives centered largely near Charleston, West Virginia. In addition, the Department of the Interior apparently considers that no mitigation in favor of North Carolina recreational benefits is permissible if recreation benefits are reduced significantly downstream. In other words, fewer net benefits to North Carolina, if any, would result.

As far as the State of North Carolina is concerned, the first priority program is to continue participation in the Federal Power Commission hearings with the objective of obtaining the optimum form of development helpful to the State, while seeking any and all means of cooperating toward a solution that support the legitimate needs of Virginia and West Virginia.

Concurrently, a high priority must be given to collection of additional water resources inventory data, analysis of needs, development of an overall North Carolina Water Plan for the Basin, and early initiation of the more non-controversial projects.

Nolichucky River Basin

The Nolichucky River Basin in North Carolina is part of the French Broad River Basin, but within North Carolina it is hydrologically independent. The total area is approximately 650 square miles, all in Appalachia. The present population (1960 Census) is about 34,000. The Basin is, for all practical purposes, entirely in the Mountain Scenic LDD.

There is no significant economic growth trend such as is being experienced along interstate highways but the Town of Spruce Pine in Mitchell County has been classified as an urban center in the Hammer-Greene-Siler report.

The average annual yield of surface water in North Carolina is in the order of 2,000,000 acre-feet. Ground water is used extensively for rural supplies, but it is impracticable to express an average annual yield capacity in similar terms to surface water yield. Ground water is obtainable in significant quantities if good exploratory and development practice is followed. Water quality is good, since major pollution from the siltation caused by mica and feldspar mining in the Spruce Pine area has been corrected.

No major impoundments exist in the Basin. Three communities have water systems.

The Nolichucky River Basin contains eleven significant sources of waste discharge which are the responsibility of both municipalities and

industry. Of these, eight or 73 percent have provided adequate waste treatment facilities in keeping with the requirements of the assigned water quality standards. The two municipalities which have met their responsibilities for providing adequate waste treatment facilities have done so at an estimated cost of \$539,740. There are two municipalities and one industry which have not, at this time, providing adequate treatment for their wastes. While the municipalities are moving forward satisfactorily in making progress toward abating their pollution, the one industry is not making such progress at this time. Engineering studies have been recommended and every effort will be made toward securing the construction of the necessary waste treatment facilities at an early date. While the cost of abating this pollution is not presently known, the facilities proposed for construction by the municipalities have an estimated cost of \$348,500. In addition, there are twelve small communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to imply that sewage collection and waste treatment facilities are needed for all of these communities, such facilities are needed in many instances to prevent public health nuisances and potential health hazards, as well as to provide opportunity for economic development. The facilities considered adequate to serve these needs have an estimated cost of \$2,353,500.

As noted previously, water quality has been greatly improved throughout the area by the construction of adequate waste treatment facilities and, when the responsibilities of those who have yet to provide such facilities have been met, it is anticipated that all the waters in the Basin will be protected in accordance with their assigned water quality standards. While it is not practicable to forecast at this time the probable waste treatment needs to the year 2020, it is believed that storage for dilution water will not be needed.

The extent of current water use has been estimated by updating the 1956 use information prepared by the Board of Water Commissioners. Domestic use, urban and rural, is estimated at 2,500 acre-feet; industrial use, both self-supplied and connected to water systems is estimated at 700 acre-feet; and agricultural use, irrigation and stock watering is estimated at 900 acre-feet, or a total of 4,100 acre-feet, which is equivalent to an average use of 3.7 million gallons per day.

The Nolichucky River Basin is not being actively studied at present, although the TVA is expected to start a Basin-wide study within the next two years. The Cane Creek Watershed in Mitchell County is authorized for planning under the P.L. 566 program. All three counties are expected to be covered in the near future by county-wide water and sewerage studies under the FHA program. The Rummel, Klepper, and Kahl Study of water and sewerage needs in selected Appalachian areas includes Spruce Pine. The North Carolina Water Plan, French Broad Section, will include this Basin, but it is in the very initial stage.

The problems entailed in planning for water resource development in this Basin are more related to inadequate highway communications, mountainous terrain, and sparse population rather than to water resource factors.

The total agricultural water requirements projected to the year 2020 are tentatively estimated at 7,600 acre-feet, made up of 2,000 acre-feet for rural domestic; 5,000 acre-feet for irrigation; and 600 acre-feet for cattle watering. The community water supplies in urban areas plus the connected industrial use is estimated to be 10,300 acre-feet. The total quantitative use of 17,900 acre-feet would average about 16 MGD.

Flood hazards are significant and future planning necessitates flood plain management, probably both structural and non-structural with Spruce Pine and **Bakersville** being emphasized as places for action.

At this time, the need for or feasibility of new hydro-electric facilities in the Basin has not been definitely established, although one sizeable potential site is described by FPC. Navigation is not considered feasible.

Recreation will unquestionably be a significant part of any comprehensive plan for this Basin but little that is definitive can be stated at this time until the North Carolina Recreation Plan is further advanced.

In view of the questionable quality of waters in this Basin, where pollution abatement measures have yet to be installed, definite measures will be required to improve the quality as indicated previously. It is not feasible at present to define the action required to meet possible future needs if economic expansion takes place as projected. There is an estimated current need for municipal waste collection and/or treatment facilities for maintenance of water quality and other purposes totalling about \$2,700,000.

It is believed that storage of dilution water for maintenance of water quality after adequate treatment has been provided will not be needed as set forth previously.

The Wildlife Resources Commission Report on the Toe River and Tributaries (1965) listed the following as the ten better sport fishing streams:

Roaring Fork Creek	Yancey County
Big Rock Creek	Yancey County
South Toe River	Yancey County
Powdermill Creek	Avery County
North Toe River	Avery County
Neals Creek	Yancey County

Horse Creek
East Prong Crabtree Creek
Crabtree Creek
Cane **River**

Avery County
Mitchell County
Mitchell County
Yancey County

Their report identifies the most damaging form of pollution as mine tailings, for which corrective steps have now been taken, and also calls attention to a common practice of dumping garbage, trash, dead animals, and other forms of debris into the streams. It recommended that this practice be stopped and that the classification of the following streams be upgraded from "D" to "C-trout":

Cattail Creek
Henson Creek
Three-Mile Creek
Wiles Creek

Yancey County
Avery County
Avery County
Mitchell County

Any comprehensive development plan should include preservation of fishing values.

Certain solutions appear to be obvious: upgrade water and waste treatment systems, as may be required in the future; control trash disposal; establish a flood plain management system; and improve fish habitat. Until a comprehensive study is made of the Basin, considerations of specific projects and alternative schemes appear premature.

The comprehensive study should be completed as soon as feasible.

Pigeon River Basin

The Pigeon River Basin in North Carolina totals about 536 square miles and is entirely in Appalachia. It is also a one-county watershed except for a small area from Canton east, which is in the French Broad. The population in the Basin (1960 Census) is estimated at less than 39,000. The entire Basin is part of the French Broad system, but in North Carolina it is hydrologically separate. The Basin is entirely within the Upper French Broad LDD.

The Hammer-Siler-Greene Report identifies Waynesville and Canton as secondary growth centers. Most of the future growth would be expected to occur in, adjacent to, and between these communities.

Although the Hepco gaging station has a drainage area of only 350 square miles, the average surface water yield portrayed by this station, somewhat less than 500,000 acre-feet, is probably a good measure of the maximum potentially available for use in North Carolina. Ground water is used for rural supplies, but availability cannot be expressed conveniently in the same manner as surface water. Ground water is obtainable in considerable quantity if good exploratory and development practices

are followed. Water quality of surface waters along the main stem is generally poor at present, owing to industrial waste discharges. The quality of water of the tributaries is generally excellent except for that of Richland Creek which receives untreated industrial waste near Hazelwood and overflows from manholes on sewers at Hazelwood and Waynesville.

Two relatively small major impoundments are owned respectively by Carolina Power and Light Company and Champion Papers, Inc. The combined surface area of the two lakes is about 425 acres with a corresponding storage volume of about 27,000 acre-feet. There are two major community water systems.

There are two municipalities, Hazelwood and Waynesville, and the Lake Junaluska Assembly, with waste collection systems discharging to a common outfall to a primary waste treatment plant; the Town of Clyde with its own waste collection system; and two industries, Champion Papers, Inc., Carolina Division, and Dayco Southern Division of Dayco Corporation, which discharge wastewaters to streams of the Pigeon River Basin. In addition, the Town of Canton has a waste collection system that discharges its wastes to Champion Papers, Inc. for treatment which presently operates a primary waste treatment plant for all of its wastes. In this respect, the Town of Canton can be said to have satisfied its responsibilities in relation to waste treatment, although the industry has yet to fulfill its complete obligation as set forth below. So far, the aforementioned towns and Champion Papers, Inc., except the Town of Clyde, have spent approximately \$3.8 million for collecting and providing primary treatment of their respective wastes. As noted previously, Champion Papers, Inc. provides treatment for its wastes and the Town of Canton. The Town of Clyde presently has under construction adequate secondary waste treatment facilities which are estimated to cost \$199,830. The Towns of Hazelwood and Waynesville, and the Lake Junaluska Assembly waste treatment facilities are adequate to protect the present uses made of Pigeon River; however, in keeping with the need to provide secondary treatment in accordance with the policies and rules and regulations of the Board of Water and Air Resources, secondary treatment will be needed as soon as financing can be arranged. The Dayco Corporation, which discharges its sewage into the Town of Hazelwood's waste collection system for treatment in the plant operated by Hazelwood, Waynesville, and the Lake Junaluska Assembly, has not at this time completed its obligations in respect to providing adequate treatment for its industrial wastes.

An estimate of current water use has been derived by modifying the 1956 data prepared by the Board of Water Commissioners. Domestic use, urban and rural, is estimated at 5,000 acre-feet; industrial use from urban systems is estimated at 3,000 acre-feet. Self-supplied industrial use is estimated at 58,000 acre-feet, and irrigation combined with cattle watering is estimated at 6,600 acre-feet, for a total of 72,600 acre-feet. This use averages about 64.8 MGD, or 13 MGD excluding the large self-supplied industrial water use.

Although the Pigeon River Basin is in Appalachia, no major contribution to the current study will be concerned with this Basin. The TVA is in the early stages of its study of this Basin, the results of which will be made known after completion of the Appalachian Water Resources Survey. A county-wide water and sewerage survey is in progress under the FHA program. The North Carolina Water Plan, French Broad Section, will include the Pigeon River, but this study is only in the very early stages.

The major problems in developing a water resources plan for this river basin has to do with the large industrial waste loading; the major economic development which seems to be in the offing; the possible lack of water and sites to accommodate all the potential demands; and the necessity for delivery of better quality of water at the State line where the river enters Tennessee in keeping with assigned uses.

Agricultural water requirements projected to the year 2020 total 10,650 acre-feet, composed of 3,000 acre-feet domestic rural; 7,000 acre-feet irrigation; and 650 acre-feet cattle watering. The urban water use including connected industry would total about 6,600 acre-feet, while the self-supplied water use could vary from the present 61,000 acre-feet to 175,000 acre-feet, if all related problems could be solved. The total quantity projection to 2020, perhaps, should not exceed 118,000 acre-feet. This represents an average use of 105 MGD.

A positive flood plain management program is a firm need, and this may include some structures. The economic development of the Basin will generate a steadily rising demand for electrical power, but the need for hydro-electric installations in the watershed of the availability of desirable sites is not clearly evident. Navigation development is not feasible. A large demand for recreation facilities will exist, but the definition in quantitative terms is not feasible until the North Carolina Recreation Plan is further advanced.

Present waste treatment objectives requires the construction of secondary waste treatment facilities by the Towns of Hazelwood and Waynesville and the Lake Junaluska Assembly, and the Town of Clyde and by Champion Papers, Inc. In addition, the small communities of Beaverdam and Phillipsville should give consideration to the construction of waste collection and secondary waste treatment facilities in order to prevent possible public health nuisances and potential health hazards and to encourage economic development. Altogether, there is a present need for the expenditure of approximately \$6.5 million for waste collection and secondary waste treatment facilities in the Basin. It is emphasized that Champion Papers, Inc. and the Town of Clyde are moving forward in abating pollution in accordance with their approved planning and time schedules. Although the Towns of Hazelwood and Waynesville, as well as the Lake Junaluska Assembly, have taken steps to eliminate overflow of sewage from manholes, they do not see how they can finance secondary waste treatment facilities at this time. While the Dayco Corporation, which

is operating under a Temporary Permit, has not resolved its industrial waste problem at this time, it is hoped that the pilot plant studies being undertaken by this Corporation will soon indicate a solution to this problem. It is not possible at this time to estimate the cost of the required waste treatment facilities. The future water quality requirements to the year 2020 are not clearly evident at this time, nor is the scope of the need for future waste treatment facilities readily defined. It is apparent, however, that if appropriate sites can be found, the storage of water for low flow augmentation will be very helpful in developing the future economy of the Basin.

The Wildlife Resources Commission has listed best fishing streams as:

- Cataloochee Creek (Trout)
- West Fork Pigeon River (Trout)
- East Fork Pigeon River (Trout)
- Little Cataloochee Creek (Trout)
- Big Creek (Trout)
- Mt. Sterling Creek (Trout)
- Pigeon River between Waters Dam and Tennessee State line
(Small-mouth Bass)

A major conclusion by the Commission is that a large amount of Basin waters are totally unfit for any type of fish management, which must be weighed against the present economic development which has served the region so well over many years.

Initial studies by the TVA in cooperation with area interests have been helpful for defining problems and for identifying potential projects. The major conclusion that is applicable is that the inventory and planning be intensified and expedited insofar as feasible. The Pigeon River Basin will be treated in the French Broad River section of the North Carolina Water Plan, which is only in the barest initial stages.

Roanoke River Basin

The Roanoke River Basin in Appalachian North Carolina is an area of about 580 square miles near the head of the Dan River Sub-basin. The present population (1960 Census) is about 35,000 people. The Appalachian portion of the Dan River Sub-basin is wholly within the Northwest LDD.

The major growth trend is in the large region around Winston-Salem. It is expected that the projected growth of that primary growth center will encompass nearly all of Forsyth County and portions of Stokes County. In addition to Winston Salem, Kernersville is identified as an urban center.

The average annual yield of surface water is very generally estimated at 619,000 acre-feet. Ground water is used rather extensively but it is not practicable to express an average annual yield capability in similar

terms to surface water yield. Ground water is readily obtainable in reasonable quantities if good exploratory and development practice is followed. Pertinent water quality information is not readily available but it is generally considered satisfactory.

No major impoundment exists in the area, although there is a minor power dam near Walnut Cove. The Town Fork Creek P.L. 566 watershed project, total estimated cost \$2,350,000, is partially complete. Three of 13 impoundments are complete, partially complete, or about to be started. The total surface area of sediment pools for this project is 437 acres, and the total floodwater storage capacity is 20,900 acre-feet.

There are presently in this Basin one small community which has a waste collection system which does not presently provide adequate treatment for its wastes, and one industry which provides adequate treatment for its wastes at the present time. In addition, there are four small communities with a population of 200 or more which presently do not have either waste collection or treatment facilities. Consideration should be given by these communities to providing adequate waste collection and treatment facilities in order to prevent possible public health nuisances and health hazards, as well as to promote economic development.

Owing to the fractional portions of the three counties located in this Basin and the resulting problem in disaggregating water use data, which is not accurate at best, the current water use is highly indefinite. Rural uses, including rural domestic, irrigation, and stock watering may be as high as 21,500 acre-feet. Urban use, including connected industry may be as high as 850 acre-feet. The total of 22,350 acre-feet is equivalent to an average daily use of 20 MGD.

Although the Basin area is included in the Appalachian area for the water resources survey, no specific activity is underway as part of that study. A county-wide water and sewerage survey has just been completed for Surry County under the FHA program. A similar study for Stokes County has been approved. No action has been initiated to start the North Carolina Water Plan study for the area.

There are no unusual problems presently foreseen in the development of water resources to meet projected needs. Rural water use in the year 2020 is estimated at 29,700 acre-feet, comprised of 4,400 domestic; 24,900 irrigation; and 400 cattle watering. Community or urban needs together with connected industry are estimated at 30,000 acre-feet, with self-supplied industry accounting for another 30,000 acre-feet. The total amount of 89,700 acre-feet corresponds to an average of 80 MGD.

There is no particular current evidence to support the need for flood control, hydro-electric power, or navigation projects, although reasonable growth experience will necessitate flood plain management increases. Recreation in the area will probably depend on locally generated demand which cannot be readily estimated until the North Carolina Recreation Plan is further advanced.

There is a present need for providing waste collection and/or treatment facilities by one municipality and four small communities at a present estimated cost of approximately \$2.0 million. While it is not practicable to forecast the needs for waste treatment facilities to the year 2020, it is believed that there will be no need for storage of water for purposes of water quality control.

The fishery is not noteworthy and future growth may necessitate special efforts to preserve and enhance what is available.

It is concluded that the proper course of action is to inventory assets, liabilities, and needs as soon as feasible as part of a Roanoke River Basin Section of the North Carolina Water Plan.

Savannah River Basin

The Savannah River Basin in North Carolina is a small (160 square miles or thereabouts) area in the extreme headwater portion. It is infinitesimal in size compared to the 10,299 square-mile area of the entire basin. The present population (1960 Census) is estimated at less than 2,000. The watershed is entirely within the Southwestern LDD.

There is no significant growth trend. The probably future development is around the resort areas near or within the Basin, notably Highlands and Cashiers.

Reasonable approximations of the yield of surface water and the availability of ground water are not readily available. With the high rainfall, however, there should be no shortage of water.

There are no major impoundments in the Basin, although there are at least six significant recreationally-oriented lakes. Apparently, there are no significant municipal water or waste facilities.

Current water use is unknown.

There are presently no large municipalities with sewage collection and waste treatment facilities in this Basin; however, there are two small communities with a population of 200 or more which should give consideration to the construction of waste collection and waste treatment facilities for the purpose of preventing possible public health nuisances and health hazards, as well as to promote economic development.

No specific treatment of this area is expected in the current Appalachian Water Resources Survey. The 1963 report of the U.S. Study Commission, Southeast, includes the Savannah River Basin and has recommended certain developments.

No firm projections of future needs, especially those expressed in terms of local requirements, are feasible at this time. However, it is

reasonably clear that this area offers major opportunities in terms of "wild rivers" or in the preservation of natural scenic values, it offers definite possibilities for intensified recreational development at various points, and there is a capability for hydro-electric power installation, though this may now be considered as marginal.

The plan for this Basin must consider a balanced choice of the possibilities with emphasis on preserving wildlife habitat. As noted previously, there are two small communities which should give consideration to providing adequate waste collection and treatment facilities. The estimated cost for such facilities is approximately \$600,000. While it is not practicable, at this time, to forecast waste treatment needs to the year 2020, it is believed that future water quality may be maintained in the receiving streams either by the provision of dilution water from reservoirs constructed for the purpose, if sites are available, or by utilizing advanced waste methods of treatment. The Wildlife Resources Commission analyzes this Basin as having very large potential for wildlife recreation activities, and stresses the need for positive action to preserve and enhance these values.

It is concluded that the North Carolina Water Plan for this area should be developed as soon as feasible and that intensive recreation and wildlife studies should be made to facilitate choice of a sound course of action. It is suggested that the previous endorsement of the Horsepasture Project be withdrawn without prejudice to permit a full range of choices in future planning. It is recommended that reservoir developments related to the downstream Keowee-Toxaway Project of the Duke Power Company be observed in the planning phases to assure that North Carolina takes any cooperative action that may be indicated.

Watauga River Basin

The Watauga River Basin in North Carolina is an area of 212 square miles in Avery and Watauga Counties, and is entirely in Appalachia. The estimated population (1960 Census) is 16,000. The Basin is entirely within the Mountain Scenic LDD.

No part of the Basin has been identified in the Hammer-Greene-Siler Report as likely or existing growth areas. The two significant towns are Banner Elk and Elk Park, and local judgment is that Banner Elk in particular is beginning to show signs of healthy economic growth.

On the basis of incomplete information, it appears that the average annual yield of surface water potentially available in North Carolina is at least 183,000 acre-feet. It is not feasible to estimate availability of ground water supplies in the same terms, but reasonable quantities of ground water are obtainable if good exploratory and development practices are followed. Water quality is generally good to excellent, except as noted below.

There are no existing impoundments of major importance. There are two small community water supplies. There are no large municipalities as such discharging wastes to the water of this Basin. The Lees McRae College at Banner Elk, which comes under the supervision of the State Board of Health, does maintain waste collection and well operated waste treatment facilities in keeping with stream requirements. The cost of these facilities is not known at this time by this Department. The one industry in the Basin, the mining operations of the former Cranberry Magnetite Corporation on Cranberry Creek, has recently been taken over by the Greenback Industries of Tennessee. While the waste disposal facilities were adequate to handle the wastes from the intermittent operation of the mine as formerly practiced, they are no longer adequate to protect the essential uses made of Cranberry Creek. The new owners have been requested to have engineering studies made and to submit a realistic time schedule for construction of adequate waste treatment facilities. In addition, there are six small communities with populations of 200 or more which should give consideration to constructing adequate waste collection and treatment facilities in order to prevent possible public health nuisances and potential health hazards, and to encourage economic development.

No specific planning activity is contemplated for the Appalachian Water Resources Survey. A county-wide water and sewerage study is underway for Avery County.

The principal problems and limitations of this watershed relate to the mountainous character, poor communications, and sparse population rather than water-related items.

As noted previously, an industry is presently in need of adequate waste treatment facilities, while six small communities should give consideration to constructing adequate waste collection and treatment facilities. Although the cost of providing the necessary industrial facilities is not known at present, the cost of the community facilities is estimated to be approximately \$1.4 million. It is not practicable at this time to forecast waste treatment needs to the year 2020; however, it is believed that special storage for water quality control will probably not be needed.

It is concluded that a general inventory of assets, liabilities, and possibilities for this River Basin should be undertaken as soon as feasible looking to the preparation of a comprehensive water plan.

Yadkin-Pee Dee River Basin

The Yadkin-Pee Dee River Basin in Appalachia is a 2,545 square mile area in ten North Carolina counties. It is a headwater area, and includes some Virginia territory and the main stream ultimately flows into S. Carolina. The estimated population in the Basin (1960 Census) is about

316,000. The major portion of the Appalachian Region lies in the Northwest LDD, with smaller portions in the Alexander-Burke-Caldwell LDD, the Blue Ridge LDD, and the Mountain Scenic LDD.

In the Hammer-Greene-Siler Report, Winston-Salem is classified as the second of the two primary growth centers in North Carolina (Asheville being the other). In the general area of Winston-Salem, Elkin, Jonesville, and Mt. Airy are classified as secondary growth centers and Mocksville, Pilot Mountain, and Kernersville as urban centers. The major thrusts of economic development appear to be in Forsyth County eastwardly along Interstate Highway 40, with medium thrusts along U.S. Highway 52 to Mt. Airy and along Interstate Highway 40 from Winston-Salem to Mocksville. Toward the west, Lenoir in Caldwell County is classified as a secondary growth center whose growth could spill over into the Yadkin Basin area. Taylorsville and Stony Point in Alexander County are both classified as urban centers. In the Wilkes County area, both Wilkesboro and North Wilkesboro are classified as secondary growth centers and the thrust of economic development trends eastwardly toward Elkin and Jonesville.

The average annual yield of surface water can be very generally approximated as 2,200,000 acre-feet. Large quantities of ground water can be obtained if good exploratory and development practices are followed; however, it is not practicable to express annual yield capability in the same terms as for surface water. Water quality is generally good.

There is one major existing impoundment in the Basin (W. Kerr Scott, surface area 1,075 acres, corresponding volume 153,000 acre-feet). Nine other impoundments of relatively minor importance exist. Thirteen community water supplies of significance exist.

There are presently in this Basin 22 significant sources of waste discharge which are the responsibility of both municipalities and industry. Of these, thirteen or 59 percent have provided adequate waste treatment facilities in keeping with the requirements of the assigned water quality standards. This relatively low percentage of adequate waste treatment is due in considerable measure to population and industrial growth in the Basin where waste treatment facilities, constructed in accordance with the Comprehensive Pollution Abatement Plan issued in 1955, have now become overloaded or the need for secondary treatment is now manifest. Six municipalities and seven industries are presently operating and maintaining waste treatment facilities in keeping with stream requirements. While the cost of the industrial waste treatment facilities is not presently known, the estimated cost for providing the municipal facilities is approximately \$3.4 million. There are seven municipalities and two industries which are not, at this time, operating waste treatment facilities required to protect the receiving streams in accordance with their assigned water quality standards. In addition, there are 31 small communities having a population of 200 or more that presently do not provide sewer services. While it is not intended to

imply that sewage collection and waste treatment facilities are needed for all of these communities, such facilities are needed in many instances to prevent public health nuisances and potential health hazards, as well as to provide opportunity for economic development.

The existing water use is subject to considerable error owing to problems in evaluating available data. Apparently, the following is a reasonable approximation:

	<u>Annual Acre-Feet</u>	<u>Average Millions of Gallons Per Day</u>
Urban and connected industry	30,000	26.8
Self-supplied industry	1,000	0.9
Rural Domestic	13,000	11.6
Irrigation and cattle watering	<u>39,000</u>	<u>34.8</u>
	83,000	74.1

The major planning study now underway is the Appalachian Water Resources Survey. A review of reports of the entire Yadkin-Pee Dee River Basin is also in progress, both of these studies being under the supervision of the U.S. Army Corps of Engineers. Comprehensive county-wide water and sewerage studies under the FHA program have been completed for two counties, two are in progress, and four are pending. Several flood plain studies are in progress or recently completed. The SCS is actively engaged in planning a number of P.L. 566 projects. The Rummel, Klepper, and Kahl Water and Sewerage Survey sponsored by the State Planning Officer is also in progress.

The development of the water resources potential of the Upper Yadkin River Basin entails no unusual restraints and the supply of water is probably ample. Major flood flows and high velocities are possible and the terrain configuration does not support very large impoundments in terms of area and volume. The narrow valley of the main stem adversely affects impoundments above Winston-Salem principally because of the high cost of relocations.

The agricultural demand by the year 2020 is estimated at 83,400 acre-feet, comprised of 20,500 rural domestic; 3,100 livestock watering; and 59,800 irrigation. Urban use, including connected industry, is estimated at 91,000. An equal amount is somewhat arbitrarily projected for self-supplied industrial use. Thus, the total estimated demand is 265,400 acre-feet, equivalent to 237 MGD.

The major growth anticipated in the area will require a comprehensive flood plain management program, to include some structural measures in larger dams, as well as considerable flood storage in P.L. 566-type

projects. There will be a large increase in the use of electric power consistent with general growth pattern, but there is no evidence readily available concerning the need or feasibility for siting new thermal or hydro-electric plants in the Appalachian Region. Navigation above Winston-Salem appears to be neither practicable or desirable. Navigation below Winston-Salem is technically feasible but no economic necessity has been shown. A very large recreation demand is envisioned but until the North Carolina Recreation Plan is further advanced, it is not feasible to provide definitive load data.

As indicated previously, there are seven municipalities and two industries presently requiring waste treatment facilities adequate to protect the receiving waters and 31 small communities which should give consideration to providing waste collection and treatment facilities in order to prevent possible public health nuisances and potential health hazards and to encourage economic development. The cost of providing the necessary principal waste treatment facilities is estimated to cost in excess of \$8.0 million, while that of providing adequate facilities for the small communities is estimated to be in excess of \$10.3 million. While it is not practicable at this time to forecast in detail the waste treatment facilities required to the year 2020, the Federal Water Pollution Control Administration has estimated that there will be a need at that time of providing 35,000 acre-feet of storage for purposes of water quality control, after secondary treatment has been provided, in the several reservoirs presently proposed by the Corps of Engineers unless advanced waste treatment is provided in the Winston-Salem area by the year 2020. The FWPCA concluded that the best solution to this problem was the storage of water in any one of the proposed reservoirs.

The Wildlife Resources Commission has identified portions of the Upper Yadkin as desirable fishing streams as follows:

- Fisher River (40 miles of designated trout waters)
- Roaring River (55 miles of designated trout waters)
- Mitchell River (16 miles of designated trout waters)
- Reddies River (40 miles of designated trout waters)
- Upper Yadkin River (75 miles of designated trout waters)
- Elk Creek

Economic and water resource development should take into account the necessity of preserving these fishery assets.

The water resource development in the Upper Yadkin should take into account the following considerations:

1. The water resources of the Upper Yadkin must be developed, not only to serve the interests of the immediate area, but also to contribute water supply, recreation and other benefits to the adjacent Piedmont area.

2. The need for agricultural flood protection and soil conservation should be satisfied.

3. A large water recreation facility or facilities is a requirement to serve the Winston-Salem area.

4. Flood protection to the Wilkesboros and to the Elkin-Jonesville region is essential to permit needed industrial development to occur.

5. Water supply storage should be provided for use within the Appalachian area.

6. Fisheries should be protected and preserved.

7. Water quality storage should be provided as indicated above.

The projects now under consideration or which will be proposed for consideration in the relatively near future are those under study or already recommended by the U.S. Army Corps of Engineers and the Soil Conservation Service. Local water supply and waste treatment projects are considered as needs rather than projects and the initiation of collection, treatment, or distribution systems is a local matter.

The U.S. Army Corps of Engineers proposed four projects in the Upper Yadkin, which are briefly summarized as follows:

Project:	Reddies River
Location:	Mile 1, 7, Reddies River
Drainage Area:	94.5 sq. mi.
Purposes:	Flood control, water supply, water quality control
Max. Water Surface:	El. 1,135.0; Area: 2,056 acres
	Volume: 103,200 acre-feet
Flood Control	
Storage:	35,000 acre-feet
Water Supply	
Storage:	9,150 acre-feet
Water Quality	
Storage:	12,000 acre-feet
Fee Simple Land	
Requirement:	3,220 acre-feet
Estimated Cost:	\$7,470,000 (Federal - \$5,458,000)
	(None-Federal - \$2,012,000)

Project:	Roaring River
Location:	Mile 2.9
Drainage Area:	129 sq. mi.
Purposes:	Flood control, water supply, water quality control, and regional development

Max. Water Surface: El. 1,115.0; Area: 2,623 acres
Volume: 126,800 acre-feet

Flood Control

Storage: 49,500 acre-feet

Water Supply

Storage: 5,160 acre-feet

Water Quality

Storage: 18,000 acre-feet

Fee Simple Land

Requirement: 4,280 acres

Estimated Cost: \$10,285,000 (Federal - \$7,999,000)
(Non-Federal - \$2,286,000)

Project: Mitchell River

Location: Mile 4.8

Drainage Area: 77 sq. mi.

Purposes: Flood control, water supply, water quality
control, recreation, regional development

Max. Water Surface: El. 1,115.0; Area: 1,530 acres
Volume: 73,500 acre-feet

Flood Control

Storage: 28,750 acre-feet

Water Supply

Storage: 12,500 acre-feet

Water Quality

Storage: 5,000 acre-feet

Fee Simple Land

Requirement: 2,400 acres

Estimated Cost: \$9,829,500 (Federal - \$7,330,000)
(Non-Federal - \$2,500,000)

Project: Fisher River

Location: Mile 4.8

Drainage Area: 135 sq. mi.

Purposes: Flood control, water supply, recreation,
regional development

Max. Water Surface: El. 1,054.00; Area: 5,320 acres
Volume: 224,000 acre-feet

Flood Control

Storage: 63,000 acre-feet

Water Supply

Storage: 68,800 acre-feet

Fee Simple Land

Requirement: 7,754 acres

Estimated Cost: \$13,863,000 (Federal - \$8,006,000)
(Non-Federal - \$5,857,000)

The proposals described thus far are catalogs of three programs, the studies by the Corps of Engineers, the Public Law 566 program, and FHA-supported programs, based on local or State expressions of needs. The proposals considered as a whole are incomplete and only partially coordinated.

Certain elements may be considered to be firm, either as a result of formal approval by the Board of Water Resources, or because of expressed needs and previous authorization. Hence, the following P.L. 566 projects are presently part of the North Carolina Water Plan:

Little Yadkin River
Deep Creek
Dutchman's Creek
Stewarts Creek-Lovills Creek

The Reddies River Project is authorized, has been recommended at various times by the Department of Water Resources, and is at least tacitly a part of the North Carolina Water Plan.

The remaining dams recommended by the Corps of Engineers are considered necessary to meet future needs, but the review of three projects and the resolution of any conflicts may require some time.

The local programs to improve and expand water facilities are in the study stage for the most part and the State's participation is still to be established. The identified waste treatment needs are, for the most part, proceeding on schedule. As other such needs are identified, the Department will advise as to financing and planning the needed facilities.

The SCS has prepared work plans or preliminary reports, of one kind or another, on the following P.L. 566 watersheds:

<u>Watershed</u>	<u>Acres</u>	<u>Status</u>
Abbotts Creek	115,300	Inactive
Deep Creek	79,450	Operational
Dutchman Creek	81,500	Operational
Forbush-Logan	30,000	Initial Planning Stages
Hunting-Bear Creek	145,725	Feasibility Report Completed
Little Yadkin River	40,000	Operational
Stewarts Creek-		
Lovills Creek	31,000	Operational
Turner Creek	6,000	Inactive
Upper South Yadkin	37,500	Feasibility Report Completed
	<hr/>	
	566,475	

This represents more than one-third of the land of the Appalachian portion of the Yadkin. Four of the projects have received the approval of the Board of Water and Air Resources, and are integrally a part of the North Carolina Water Plan, insofar as it exists today. These projects entail 33 impoundments of which twelve have been completed and 165.2 miles of stream channel improvement. The present total cost estimate is \$8,235,000.

The two projects for which feasibility reports have been completed were studies in connection with the Appalachian Water Resources Survey. Preliminary comments have been made by the Department of Water and Air Resources but review and approval of these projects will be deferred until such time as a formal work plan is submitted by the sponsoring organizations. The feasibility reports estimate that these two projects will cost a total of \$6,966,900 if presently identified needs are met. If the full potential of the structures contemplated is developed, the cost will be \$16,325,400.

It is recommended that those projects which have already been approved by the State should be expeditiously prosecuted.

The program of basic data collection, posting of required information on maps, and the analysis of problems and possible solutions, necessary in the process of developing the North Carolina Water Plan, should be carried on as expeditiously as feasible.

Those projects not already approved should be reviewed as soon as it is practicable and a recommended State action established.

The possibility of inter-basin transfers of water, although controversial, should be carefully explored in conjunction with other studies such as on the Roanoke and the Cape Fear. The first step is to determine whether measures adopted for those basins will be sufficient, or whether a real need for transfers is likely to occur.

Information on water quality storage needed is incomplete, although FWPCA has provided some quantity projections for use by the Corps of Engineers in its plan. The extent to which P.L. 566 projects may be used to augment flow should be studied. At present, water quality control is not a project purpose in these projects.

In view of the several FHA comprehensive plans to be completed in the near future, a thorough review of the place of P.L. 566 projects in supplying community water supply needs is warranted.

The statement by the Director, Department of Water and Air Resources, at a hearing in Winston-Salem, January 4, 1968, is quoted below as reflecting the current official position:

"Surface-water resources in the Upper Yadkin River Basin are plentiful. These resources, if properly harnessed and developed, will adequately support a substantial degree of industrial and urban expansion. The growth potential of the Upper Yadkin is indeed favorable.

"Construction of the Kerr Scott Dam and Reservoir was a major step in developing the Upper Yadkin area. This project is bringing continuing benefits in terms of flood control, water supply, water quality improvement, and recreation. Other similar steps are required to further harness and develop water resources in the Upper Yadkin Basin.

"The Charleston District Engineer has studied the Upper Yadkin area and has developed preliminary data that are available for consideration and discussion at this hearing. The results of study to this point suggest the construction of four dams and reservoirs, to be located on the Reddies, Roaring, Mitchell and Fisher Rivers - all of which are tributaries to the Yadkin River.

"The State of North Carolina strongly supports the Army Engineers' study and will cooperate fully with the District Engineer in carrying it to completion. The information now available provides impressive evidence of the need for further development and of the benefits that would accrue from the four projects suggested by the study to this point. The proposed Mitchell River Project poses several questions regarding its effect on fish and wildlife conservation. These questions will be resolved with the Engineers. As the study progresses, the State will continue to evaluate it, along with other related studies and projects, in the light of the State's objective to preserve and develop its water resources in the best interests of all its citizens and for the general welfare. When the study is complete and the Engineers' final report is available, responsible State agencies will carefully assess its findings and recommendations. Following this assessment, the Board of Water and Air Resources, in coordination with other interested agencies, will make recommendations to the Governor. A firm State position on specific projects will then be established."

Findings and Conclusions

The brief **statements** provided in the thirteen river basin sections

preceding provide a reasonably concise and current estimate of the status of water resources development.

The 29-county area constitutes 24 percent of the land area of the State and the 1967 estimated population of 1,088,000 constitutes 21 percent of the State's population. In an average year, the total stream flow exceeds 15,000,000 acre-feet, while the major uses exclusive of hydro-electric generation, certain cooling functions, and institutional uses total little over 300,000 acre-feet. This would imply that there is an ample water supply for current purposes, a fact which is generally true. However, the distribution of flow geographically, its timing, the low and high flows, the relative locations of use, and the introduction of pollution, all combine to determine whether or not water is available where it is needed and of adequate quality.

In seeking to analyze water availability and use, it became evident that a large amount of data collection, review, and analysis are still necessary to produce a meaningful picture of the water situation in the region. Only then can projections of possible future use be sufficiently significant to support large promotional type investments in water and waste treatment facilities. However, there are sufficient facts available to support large investments in the relatively near future for current and near future needs.

The two large areas of weakness, in respect to projections of need for large quantities of water, are those for agriculture (irrigation) and industry. It is believed that a much better job can be done of forecasting probable irrigation requirements, or at least setting a rational ceiling of probable use to consider in water budgeting. Similarly, it is believed an inventory of industrial sites, as related to water, can be combined with facts relating to potential or desired industry in such a way as to permit more meaningful planning of water resources development.

Projections to the year 2020 were made based on the maximum population assumptions as proposed by the Office of Appalachian Studies. Because current per capita use in the municipal systems varied between wide limits, two constants were set, one of 65 gallons per capita per day for rural domestic use, and 100 gallons per capita per day for urban community systems, the latter figure including normal commercial and industrial use. Institutional uses under State Board of Health supervision, not connected to community water supplies, were not considered. Hydroelectric power production use was ignored for the purposes of this Report and large thermal cooling systems were also ignored.

In round figures the projections to the year 2020 were as follows:

General Projections of Water Use to Year 2020		
	Total Annual Use (Acre-Feet)	Corresponding Average Daily Use (MGD)
Rural Domestic	50,000	44.6
Stock Watering	12,000	10.7
Irrigation	<u>180,000</u>	<u>160.7</u>
Total Rural	248,000	216.0
Urban with Connected Industry	256,000	228.6
to	275,000	245.5
Self-supplied Industrial	307,000	274.1
to	<u>456,000</u>	<u>407.1</u>
Grand Total	811,000	724.1
to	979,000	to 874.1

By increasing urban system projected use to 200 gallons per capita per day, as had been done in some local studies, the total projected water use can readily exceed 1,000,000 acre-feet or one-fifteenth of the gross average surface water supply. Such a use will introduce major problems in the areas of largest economic growth.

The water resource project needs to go with the projected economic and population expansion are classified generally as major multiple-purpose or single-purpose systems development typical of the U.S. Army Corps of Engineers, Tennessee Valley Authority, and private power interests, major upstream systems oriented to agriculture such as small watershed activities of the U.S. Soil Conservation Service, and local or regional public and private projects for water supply and for waste disposal.

Following is a tabulation of important developments now foreseen as needed to support existing needs and portions of the projected economic growth:

<u>Major Systems or Single Impoundments</u>	<u>Definitely Supported by the State of North Carolina</u>	<u>Currently Being Considered by the State of N. C.</u>
Broad River Basin		\$35,700,000
French Broad River Basin	\$ 96,000,000	
New River Basin	73,800,000	
Savannah River Basin	Minor	
Yadkin-Pee Dee River Basin	7,470,000	33,977,500
<u>Small Watershed Program</u>		
Broad River Basin		1,168,300
Catawba River Basin	1,376,500	
Little Tennessee River Basin	Minor	3,385,000
Roanoke River Basin	2,350,000	
Yadkin-Pee Dee River Basin	<u>8,245,000</u>	<u>6,966,900</u>
	\$189,231,500	\$81,217,700
	\$270,449,200	

The projected needs for waste treatment facilities can best be described by summarizing the program, the present status and future known needs. The comprehensive pollution studies started in the Yadkin River Basin in 1952 and the Appalachian area was completed with the issuance of comprehensive pollution abatement plans for the New and Watauga River Basins in 1963. Following the issuance of the various plans commendable progress in abatement has been made both by industries and municipalities. In those instances where municipalities and industries have not yet actually complied, the majority are making satisfactory progress in planning, financing, and construction.

Of the 59 municipalities in the Appalachian Region which provide sewer services:

	<u>Estimated Cost</u>
27 have provided satisfactory facilities	\$10,000,000
22 have under construction, or preparing to construct, the needed facilities	20,700,000
9 of the 10 remaining are making satisfactory progress. The tenth is having financial problems.	11,400,000
	<u>\$41,100,000</u>

There are 116 other communities having a population of 200 or more that aggregate 55,758 (1960 Census). Although sewage collection and treatment facilities may not be needed in every one of these communities, they are needed in many instances to prevent public health nuisances and potential health hazards, as well as to provide an opportunity for economic development. The cost is \$31,700,000.

Industries have not been idle since the issuance of the pollution abatement plans. Presently 80 have significant industrial waste discharges into streams. Of these, 63 are presently providing adequate treatment and 17 have yet to do so. Thus, there is a total of \$62,800,000 of municipal facilities requirements backlogged. The industrial backlog estimated cost is not available. Beyond this point it is not yet feasible to project either completely, or intelligently the estimated growth needs or even the needs most likely to serve as catalysts to encourage growth.

There is no readily available comparable statement on water supply needs. However, Rummel, Klepper, and Kahl are in the middle stages of their study of water and waste treatment facilities expansion needs to support and to generate growth along the major highway corridors. It is too early to draw conclusions and estimates from their study, but, thus far, they have identified nearly \$31,000,000 in potential water supply construction, and about \$22,000,000 in potential waste facility construction.

Therefore, it can be seen that direct construction needs that have been thus far described total more than \$386,000,000 which is a very large figure.

The internal process by which the State of North Carolina reviews proposed water resource development projects entails coordination of local and State interests by the Board of Water and Air Resources, resolution of conflicts, and the preparation of an official State position for enunciation by the Governor. The circumstances and time scheduling of the Appalachian Water Resources Survey preclude inclusions in the Report of a definitive State position on all subjects or projects. Hence this Supplement constitutes a statement from the point of view of the State of North Carolina covering matters of interest in the development of water resources. It provides general background information, clarification of certain attitudes, practices, and policies, as well as firm commitment in support of some project proposals which have advanced sufficiently to permit such commitment. Provisions should be made to up-date and modify the information and findings in the Report under Sec. 206 of the Act, and the deadline of December 31, 1968, for submission should not be considered to be a bar to further amplification, refinement, or expansion of the subject matter in later supplemental reports.

The close interdependence of air and water pollution control measures deserves comment. This Board has found that measures in lieu of permitting waste discharge to streams oftentimes may entail omission of pollutants to the atmosphere and vice versa. A current industrial problem in the North Carolina Appalachian Region has highlighted this fact and emphasized the need for close coordination of air pollution programs with water pollution programs.

North Carolina Water Laws Passed in 1967

1. Water Use Act of 1967

North Carolina has a water quality control law, regulating the disposal of water-borne wastes, the State Stream Sanitation Act. That law is literally broad enough to cover both ground and surface water, but has only been activated as to surface water. Until the Water Use Act of 1967 was passed, North Carolina had no legislation on the books to regulate the use of water, other than a water supply emergency law, which has never been applied since it was passed ten years ago.

Chapter 933, Session Laws of 1967, represents a limited extension of the present emergency law to the next logical step of water use legislation: the regulation of water use in "capacity-use areas", or areas of shortage - whether the shortage be brought about by natural scarcity, by unusually heavy demands, or by some combination of the two.

This law gives the North Carolina Board of Water and Air Resources the authority to coordinate and in limited ways to regulate the use of water in areas which have been formally found to be in need of such action.

A three-step process is provided. First the Board, after studies and hearings, must find that a "capacity-use area" should be declared. In this phase the Board is specifically directed to pursue all alternatives short of regulation. Second, the Board must conduct a rule-making proceeding. Here, if it finds, after further hearings, that any controls are appropriate, the Board is to choose from a specified group of provisions those which it considers appropriate to the particular area. Third, permits are issued to large water users, whose usage is likely to contribute substantially to the problems of water-short areas. In these permits, conditions may be included to carry forward the purposes of the regulations that were adopted in phase No. 2 of the proceedings. No permit conditions can go beyond the scope of those regulations.

To insure that only the larger users will be brought under regulation, minimum permit size is fixed at 100,000 gpd. To assure that only those users are regulated (even among the 100,000 gpd class)

who really contribute significantly to the problem, the permits with conditions are required only for "consumptive users" of water - those who substantially impair quantity and quality. Finally, to insure that fixed investments are not unfairly impaired, the Board is directed to take into consideration the reasonable needs of existing and certain potential water users, to the extent that their needs do not unreasonably damage others. Detailed standards are spelled out to guide the Board, both in adopting rules and in issuing permits.

The same opportunity for court review is provided in this law as for review of pollution control orders under the Water and Air Reorganization law. Consistent with the ultimate unity of the hydrologic cycle, the bill treats both surface and ground water in one law that applies equally to both. However, in recognition of the better developed and more equitable rules of law that now govern the use of surface water (by comparison with ground water), the bill expresses an intent that the Board operate generally within the framework of the concept of riparian rights to surface streams.

The activation of any capacity-use area is likely to require at least a year's time, and perhaps longer. Minimum formal notice periods for administrative proceedings to declare a capacity-use area require six months. If a single appeal is taken at each of the three principal stages, another 45 days of minimum notice periods will run for each contested appeal. Time spent by the Board in its initial background study and in preparing proposed regulations and permits will be in addition to these notice periods.

A section by section analysis follows:

SECTION 1. Short Title

This section entitles the bill as the "Water Use Act of 1967."

SECTION 2. Declaration of Purpose

This section states a dual purpose for the Water Use Act: first, that the general welfare requires that the water resources of North Carolina be put to their fullest potential beneficial use; and second, that this beneficial use should be subject to reasonable regulation in the interest of both conservation and development. The first purpose is already expressed by Law (GS 143-351). This bill adds the second purpose.

SECTION 3. Declaration of Capacity-Use Areas

This section permits the Board of Water and Air Resources to declare "capacity-use areas", and spells out the procedures for doing so. In order to declare a capacity-use area, the Board must find one of

two conditions: either that water use in the area has developed (or is threatening to develop) to a degree requiring regulation, or that use of water in the area is exceeding (or threatening to exceed) renewal or replenishment. Before making these findings the Board must receive a Departmental report based on a study of the need for action, and must hold public hearings in the affected area. The notice and hearing provisions of this section are based on similar procedures in the Water and Air Resources reorganization law.

SECTION 4. Regulations within Capacity-Use Areas

This section prescribes the next step to be taken by the Board of Water and Air Resources after it has declared a capacity-use area. The section directs the Board to prepare proposed regulations, shaped to the needs of the particular area; to hold hearings on the proposed regulations; and then to take final action on the proposals.

The Board is not given unlimited rule-making powers by this section. It can only select (for any particular capacity-use area) regulations from the following categories:

- . . . Informational reporting requirements.
- . . . Well spacing requirements, and limitations on well pumping levels or pumping rates.
- . . . Provisions concerning timing of water withdrawals.
- . . . Provisions to protect against salt water encroachment, and to protect against unreasonable adverse effects on other water users.
- . . . Other provisions needed to implement the purpose of the Act that are not inconsistent with the Act.

SECTION 5. Permits for Water Use within Capacity-Use Areas:

Procedures

This section provides for issuance of permits to water users within capacity-use areas and spells out the procedures for notices and hearings, concerning permits. It also prescribes the procedures for appeals from final orders and decisions under the Act. Finally, subsection (h) of this section specifics a number of factors for the Board to consider in adopting regulations and issuing permits - including such matters as the nature and size of the stream or aquifer; the importance and extent of the various uses; and the nature of any threatened impairment of the stream or aquifer and its probable severity and duration.

Only water users using more than 100,000 gpd of water are required to obtain permits. Those whose use is "non-consumptive" in nature (a term defined in section II) are entitled to receive permits without attached conditions and can only be required to supply factual information concerning water use for the Board's information. It is only the "consumptive" user of water of more than 100,000 gpd of water who must obtain a permit containing regulatory conditions. The Board is empowered by this section to attach conditions to such permits to implement its regulations for the capacity-use area. It may also grant nonconforming temporary permits, and deny, modify, and revoke permits.

SECTION 6. Permits for Water Use within Capacity-Use Areas (Cont'd)

This section contains additional provisions that provide for the duration of permits, spell out informational requirements, and define the status of existing and potential water users.

Under this section permits may be issued for no longer than the longest of the following periods: ten years, or the duration of the capacity-use area or a reasonable amortization period for the permit holder's water-using facilities. Ordinarily, this will probably mean that the maximum length of a permit will be determined by amortization periods, but in some circumstances the ten-year limit or the termination of a capacity-use area may limit the permit term.

This bill contains no "grandfather clause" in the usual sense of flatly exempting certain existing interests. Nor does it allow a fixed period for claimants to file plans for water use. As to existing water users, it provides that the Board shall consider the extent to which prior use of water was reasonably necessary for the applicant's needs and shall grant a permit meeting those reasonable needs. As to persons with prior investments in land who are potential (but not existing) water users, this section directs the Board to take into consideration these prior investments, as well as plans for water use in connection with these lands which are submitted to the Board within a reasonable time after enactment of the bill. It provides no assurance that either existing or potential water users will be covered into the law without meeting requirements imposed on other water users, or will be automatically allowed to continue existing levels of water use. Indeed, it specifically provides that no permit shall be granted to existing or potential users that will have unreasonably adverse effects on other water users in the area, present or potential.

SECTION 7. Violations

This section fixes a criminal penalty of a \$100 to \$1000 fine for violations of the Act. It also empowers the Department to seek an injunction in Superior Court to restrain violations.

SECTION 8. Map or Description of Boundaries of Capacity-Use Areas

This section gives the Board the alternative of defining the boundaries of capacity-use areas by maps, drawings, written descriptions or any combination of these methods. It also provides for filing of the boundaries with the Secretary of State.

SECTION 9. Rights of Investigation, Entry, Access and Inspection

This section details the rights of the Board and its agents to conduct investigations, and for this purpose to enter on public or private property to investigate matters relevant to the administration of the Act, and to require statements or reports under oath. Protection against disclosure of trade secrets, proprietary information and the like are spelled out.

SECTION 10. Rules and Regulations

This section authorizes the Board to adopt rules and regulations implementing the Act, which are to be filed with the Secretary of State.

SECTION 11. Definitions

The two most important definitions are of "consumptive use" and "non-consumptive use". These definitions are significant because a non-consumptive water user is entitled to receive a permit without regulatory conditions, while a consumptive water user meeting other specifications of the Act must obtain a permit with regulatory conditions.

"Consumptive-uses" are defined as all water uses that are not non-consumptive. A "non-consumptive use" is defined as follows:

(1) In the case of a use of water withdrawn from a surface stream, it means the use of water withdrawn in such a way that it is returned to the stream at or near where it was withdrawn, without substantial diminution in quantity.

(2) In the case of ground water, it means the use of water withdrawn in such a way that it is returned to the ground water system or aquifer at or near the point of withdrawal, without substantial diminution in quantity or substantial impairment in quality. (The additional factor of "quality impairment" is included as to ground water, but not as to surface water, because the State has a going program of water pollution control for streams and not for ground water.) In determining whether a use of ground water is non-consumptive, and thus virtually exempt from regulation, the Board is authorized by this section to take into consideration the fact that the water user - even though returning the water to the aquifer - has caused a reduction of aquifer water

pressure resulting in damage to other water users, and has not adequately compensated the other water users for this change.

SECTION 12. Law of Riparian Rights not Changed

This section states the intent of the Act not to change or modify the relative rights of riparian owners, under existing common or statute law, to make non-consumptive use of surface waters.

SECTION 13. Codification

This section directs the Attorney General to appropriately codify the Act. In doing so, he is permitted to combine any duplication provisions that may be enacted during this legislative session in the several water resource bills now pending or already passed.

SECTION 14. Severability

This section provides a general severability clause, indicating that if any provision of the Act were later held invalid, this should not affect other provisions that might stand without the invalid parts.

SECTION 15. Effective Date

The Act is declared to be effective upon its ratification.

2. Authority to Provide Assurances

NOTE: The above heading is meant to identify Chapter 1071, 1967 Session Laws: An Act to amend Article 38 of Chapter 143 of the North Carolina General Statutes Relating to the Powers and Duties of the Board of Water and Air Resources.

This law is intended to strengthen the basis for supporting the provision of water supply or other facilities of interest to the State in Federal reservoirs. Prior to enactment the Federal agencies sought such commitments from individual municipalities or other local agencies. These governmental units were sometimes handicapped by (1) not being able to obligate future successor administrations, or (2) by lack of knowledge to recognize the potential future demand. On the other hand, the State Water and Air Resources Department is ordinarily in a better position to foresee future needs on a regional or state-wide basis. The essential features of the law are as follows:

(1) The Board is authorized to give to the Federal Agency assurances for water supply storage in suitable quantity, subject to the availability of State funds or applicable funds or assurances from local governments.

(2) The Board is authorized to assign, reassign, or transfer to municipal or local governments suitable shares of the total water supply, subject to equitable adjustment of financial responsibility.

(3) The existing law charging the Board to seek aid through the State Congressional delegation for financing water resource projects is expended to cite specifically water supply, water quality control, and other purposes.

(4) Expanding existing law to charge the Board of Water and Air Resources with the responsibility of cooperation with all Federal and interstate agencies in planning and developing any water resources project.

3. Water Reporting System

NOTE: The above heading is meant to identify Chapter 1117, 1967 North Carolina Session Laws: An Act to Authorize the North Carolina Board of Water and Air Resources to Establish a System of Reporting Water Use Information.

The law, as proposed, sought authority for the Board to establish a system of reporting water use information and to adopt reasonable rules and regulations to accomplish this end.

The law, as passed, was more specific and probably has more force than the proposal. It is binding upon any person using, withdrawing, diverting or obtaining water from surface streams, lakes, and under ground water sources. A monthly report is specified on a form to be supplied by the Department. The form shall:

- (1) Show identification of the water well or withdrawal facility.
- (2) Location.
- (3) Rate of withdrawal in gallons per minute.
- (4) Total monthly withdrawal in gallons.

Filing is required on or before the 15th of the following month.

Exempted uses for reporting purposes are: household, livestock, or gardens.

4. North Carolina Well Standards Construction Act

NOTE: This heading is meant to identify Chapter 1157, 1967 North Carolina Session Laws: An Act to Grant the North Carolina Board of

Water and Air Resources the Authority within Certain Prescribed
Limitations to Administer the Law Relating to Well Construction.

This is a new law intended to protect the ground water resources of the State and the interests of well owners. It is described by citing below extracts from the interim procedures issued by the Department:

(1) Permits for Well Construction

A permit is required prior to the construction of any well:

(a) with a designed capacity of 100,000 gallons per day or more;

(b) in any well system with a designed capacity of 100,000 gallons per day or more;

(c) in a geographic area where the Board finds permission necessary to protect the ground-water resources and the public welfare, safety and health.

(2) Application for a Permit to Construct a Well

An application for a permit to construct a well:

(a) shall be submitted to the Department of Water and Air Resources in duplicate on forms furnished by the Department;

(b) shall be approved or rejected within a period of 15 days after receipt of application by the Department.

(3) Report of Well Construction or Abandonment

Any person completing or abandoning any well shall submit a record of the construction or abandonment:

(a) to the Department of Water and Air Resources;

(b) on forms furnished by the Department;

(c) within thirty (30) days after completing the construction or abandonment.

(4) Prevention of Contamination

Every well shall be constructed and maintained in a condition whereby it is not a source or channel of contamination.

(5) Flowing Artesian Wells

(a) Every flowing artesian well shall be equipped with a valve so that the flow can be completely stopped.

(b) The casing on every flowing well shall be maintained in such condition that the flow can be completely stopped.

(c) Valves on every flowing well shall be closed when beneficial use is not being made of the well.

(6) Access Port

(a) Every water supply well shall be equipped with a usable access port or airline.

(b) Airlines shall not be required on any water supply well constructed for domestic use for a single family dwelling, any well having an inside diameter of 4 inches or less, or any well not equipped with a pump.

(c) Access ports and airlines shall have a minimum inside diameter opening of 0.5 inch so that the position of the water level may be determined by measurement with a steel or electric tape at any time.

(d) The access port or airline shall be installed and maintained in such a manner as to prevent entrance of water or foreign material.

(7) Mineralized Water

In any well that penetrates an aquifer or stratum containing non-potable mineralized water, this stratum or aquifer shall be adequately cased, cemented, or both, so that contamination of ground-water zones above or below the stratum will not occur.

(8) Polluted Water

In constructing any well, all water bearing zones known to contain polluted water shall be adequately cased or cemented off so that pollution of the overlying or underlying ground-water zones will not occur.

(9) Well Tests

Every water-supply well shall be tested for capacity by a method and for a period of time acceptable to the Department depending on the intended use of the well. The results of the test shall be submitted to the Department as a part of the well completion record.

(a) Capacity tests for a domestic water-supply well shall be conducted by a method and period of time to satisfactorily show the dependable yield of the well.

(b) Capacity tests for public, industrial, commercial and irrigation wells shall be conducted in accordance with contract specifications for the individual well, but shall be tested by a method and period of time to satisfactorily show the optimum yield in gallons per minute that can be maintained continuously.

(10) Use of a Well for Recharge or Disposal

No well shall be used for recharge, injection, or disposal purposes without the prior permission from the Board of Water and Air Resources, after consultation with, and recommendation, by the State Board of Health.

(11) Abandonment of Wells

(a) Temporary Abandonment - When any well is temporarily removed from service, the top of the well shall be sealed with a water-tight cap or seal.

(b) Permanent Abandonment - Any well that is to be permanently abandoned shall be filled, plugged or sealed in such a manner as to prevent the well from being a channel allowing the vertical movement of water and a source of contamination of the ground water supply.

The procedures cited apply only to wells covered under the Act. Excluded are wells constructed for domestic use on land appurtenant to single-family dwellings. Under a limited grandfather clause, the permit requirements of the Act do not apply to wells or pumps existing and in use on the effective date.

5. Dam Safety Law of 1967

NOTE: This heading is intended to identify Chapter 1068, 1967 North Carolina Session Laws: An Act to provide for Certification and Inspection of Certain Dams, under the Supervision of the North Carolina Department of Water and Air Resources.

No previous controls over dam construction and operation existed except limited stipulations in Chapter 139 GS affecting approval of small watershed project work plans by the Board of Water Resources and by malaria control regulations of the Board of Health applying to impoundments.

Following are listed significant provisions of the Act:

SECTION 3. This section defines dams which are exempt, namely:

(1) Any Federally-sponsored dam when the Federal agency designed or approved plans and supervised construction. Exemption ceases when the agency relinquishes operation and maintenance authority to a local entity.

(2) Any dam licensed by the Federal Power Commission or for electric generating facilities approved through a Certificate of Convenience and Necessity from the North Carolina Utilities Commission.

(3) Any dam under a single ownership posing no threat to life or property below another under ownership.

(4) Any dam less than 15-feet high (from original stream bottom to crest) or which impounds less than 10 acre-feet or costing less than \$5,000.

It also defines "minimum stream flows" for the purpose of the Act as those quantities and qualities required to maintain prescribed stream classification and water quality standards under North Carolina law. It permits the Department to impose conditions and requirements relating to discharges, location and design of outlets, amount and timing of withdrawals, and the construction of submerged weirs and other devices if necessary.

SECTION 4. Any person contemplating the construction of a dam within the scope of this Act must file a statement with the Department at least 10 days before construction is begun, describing (1) height; (2) impoundment capacity; (3) purpose; (4) location; and (5) other information required by the Department.

Persons will also comply with malaria control requirements of the Board of Health.

The Department will determine from the statement whether the proposed dam is exempt or subject to the Act. (NOTE: If the person contemplating construction concludes it is not subject to the Act, he need not file and the Department will not have the opportunity to rule on the subject unless word is received from another source.)

The Department may require additional information from applicants such as: stream flow, rainfall data, maps, plans and specifications.

Each applicant must file the certificate of an engineer or contractor legally qualified in the State of North Carolina that he is responsible for the design and that the design is safe. Any applicant having a registered professional engineer employee may use him for this purpose.

The Department will clear applications as necessary with other State agencies.

SECTION 5. Before commencing the repair, alteration, or removal of dams, written approval of the Department must be secured generally as outlined in Section 4 for new construction. Repairs urgently required for safeguarding life and property may be started immediately but the Department must be notified and its subsequent orders complied with.

SECTION 6. The Department may approve or disapprove applications or stipulate conditions to insure safety and minimum stream flow requirements of a routine nature.

SECTION 7. States that work under Sections 4 and 5 shall be designated and supervised by an engineer legally qualified in the State of North Carolina. (NOTE: This section omits the reference to "contractors". The effect of this inconsistency is uncertain.)

Board may require progress reports.

Board may order compliance, if work is not being done according to plans and specifications, and may stop work until there is compliance.

SECTION 8. Requires completion reports and suitable descriptive data. Completed work to be inspected by the supervising engineers and a certificate issued.

Dam not to be used until Board has granted final approval, except as the Board may authorize.

SECTION 9. The Board has supervision over the maintenance and operation of dams to safeguard life and property and to satisfy minimum stream flow requirements.

The Board may adopt maintenance and operation standards as necessary for the purposes of this Act.

SECTION 10. The Board may, on its own motion or by request from any affected agency, inspect any dam by regaining consulting engineers for that purpose.

The Board will endeavor to provide for inspection of all dams at five-year intervals, funds being available.

The Board may order correction of dangerous conditions or conditions preventing maintenance of stream flow requirements.

If time does not permit following routine procedures the Board may take immediate corrective measures and collect the cost from the owner.

SECTIONS 11-18. These are routine stipulations on judicial review, right of entry, investigations, liability for damages, violations and penalties, etc.

6. Flood Plain Management Law

NOTE: This title is intended to describe Chapter 1070, 1967 North Carolina Session Laws. An Act to authorize the North Carolina Department of Water and Air Resources to Assist, Coordinate, and Otherwise Participate with Local Levels of Government in a Program of Flood Plain Management.

This law expands a responsibility that exists in the prior law, although not so specifically stated. It emphasizes the importance of flood plain management and places the primary responsibility for land-use regulations that may be required on local levels of government.

The Department is directed to initiate, plan, study, and execute a long range flood plain management program for the promotion of the health, safety, and welfare of the public.

It is directed to pursue an active educational program, to include a special discussion in each biennial report, to suggest legislation, etc.

It is authorized to publish flood plain criteria for guidance in applicable instances to those responsible for work plans for small watershed projects.

7. Well Driller Registration Act and Information Reporting

NOTE: The title is intended to describe Chapter 1069, 1967 North Carolina Session Laws: An Act to Amend the Well Driller Registration Act as Set Forth in Article 38 of Chapter 143 of the North Carolina General Statutes.

This law is generally concerned with procedural changes in existing law designed to make this law an effective tool for securing well cuttings as a source of information for the Department. It does strengthen the rights of the individual owner or well driller in that the Department is not authorized to release the results of its analysis of well cuttings until authorized by the owner in writing.

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TABLE S - 1
(TENTATIVE)

RELATIVE RESPONSIBILITIES OF GOVERNMENTAL
AND PRIVATE INTERESTS IN WATER RESOURCE
PLANNING AND DEVELOPMENT^a

PURPOSE AND PERTINENT NORTH CAROLINA STATE AGENCIES	FEDERAL	STATE	LOCAL	PRIVATE
<u>Responsibility Keys:</u>	<u>Function Keys:</u>			
A. Major (a very high degree of responsibility)	1. Fact finding; data collection			
B. Limited (a very high or high degree of responsibility which is limited by law or custom)	2. Planning			
C. Minor (some responsibility, but not great when compared to other levels)	3. Grants or loans (including "assurances")			
D. Negligible (insignificant responsibility, if any)	4. Acquire, build, or operate			
	5. Research			
	6. Regulation			
	7. Coordination			
	8. Education			
<u>FLOOD PLAIN MANAGEMENT</u>				
<u>Flood Control</u>	A-12 4	B-123 678	B- 2 67	D-
Board of W & A Resources		A-123 78		
N.C. Seashore Commission		B-1 8		
State Soil and Water Conservation Committee		A-123 5 78		
<u>Flood Plain Use</u>	C-12 7	A-12 678	A-1 67	B-
Board of W & A Resources		A-12 78		
Board of C & D-Comm. Pl.		A-12 78		
Department of Insurance		C- 6		
Univ. of N.C. - Dept. of City & Reg. Pl.		B-1 5 8		
<u>Land Use and Treatment</u>	A-123 5678	B-12 5678	B- 2 67	A-e
Board of W & A Resources		B-12 78		
Board of C & D-Comm. Pl.		B-12 78		
N.C. Seashore Commission		B-1 8		
Univ. of N.C.-Dept. of City & Reg. Pl.		B-1 5 8		
<u>FOREST AND MINERAL PRODUCTION</u>	B-12 5678	B-12 567	D-	A- 2 5 7 ^e
Board of C & D-Forestry		B-12 567		
Board of C & D-Geologist		B-12 567		
Board of C & D-Com. & Ind.		B-12		
Labor Department		A- 6		
Board of W & A Resources (water as a mineral)		B-12 678		
<u>GRAZING AND CROPLAND IMPROVEMENT</u>	B-123 5 78	B-12 56 8	B- 2 7	A- 2 4
Dept. of Agriculture		B-12 56 8		
Soil and Water Cons. Com.		B-12 8		
UNC-Agric. Ext. Service		B-1 5 8		
<u>HYDROELECTRIC POWER</u>	A-12 4 7 ^d	C- 6	D-	A-12 4
Utilities Commission		C- 6		
Board of W & A Resources		C-1		
Rural Electrification Admin.		C-12 78		
<u>NAVIGATION</u>	A-12 4 678	A-1234 78 ^c	C- 6 ^c	D-
State Ports Authority		A-12 4 78		
Board of W & A Resources		A-123 78		
State Highway Commission		C- 4		

TABLE S - 2

PURPOSE AND PERTINENT NORTH CAROLINA STATE AGENCIES	FEDERAL	STATE	LOCAL	PRIVATE
<u>OUTDOOR RECREATION</u>				
<u>General</u>	A-12 45 78	A-12 45678	A- 2 4 67	C- 2 4 ^f
N.C. Recreation Commission		A-12 5 78		
Dept. of Admin. SPTF		A-123 5 7		
Board of C&D-Parks		A-12 4 678		
N.C. Seashore Commission		B-1 8		
Board of W&A Resources		C-1 67		
<u>Fish and Wildlife</u>	B-1234 678	A-12 45678	D-	C- 2 4 ^f
Wildlife Resources Commission		A-12 45678		
Board of C&D-CSF		A-12 5678		
Board of W&A Resources		B-12 67		
<u>PRESERVATION</u>				
<u>Unique Areas</u>	A-12 45678	B- 2 4 678	C- 2 4 67	D-
Dept. of Archives & History		B-12 4 78		
Board of C&D		B-12 78		
Wildlife Resources Commission		B-12 4 78		
Univ. of N.C.-Dept. of City & Regional Planning		B-1 5 8		
<u>Reservoir Sites for Future Dev.</u>	B-12 7	A-12 678	A- 2 45 7	D-
Board of W&A Resources		A-12 78		
Board of C&D-Comm. Planning		A-12 8		
Board of Health-SED		A-12 678		
Univ. of N.C.-Dept. of City & Regional Planning		B-1 5 8		
<u>WATER QUALITY CONTROL</u>				
<u>Waste Treatment</u>	B-1 3 6	A-1 5678	A- 2 4	A- 2 4
Board of W&A Resources		A-1 678		
Board of Health-SED		A-1 678		
Dept. of Admin.-PCO		A- 2 4		
Wildlife Resources Commission		A-12 7		
Board of C&D-CSF		A-12 7		
Local Government Commission		B- 6		
UNC-School of Public Health		A-1 5 8		
NCSU-School of Engineering		A-1 5 8		
<u>Low Flow Augmentation</u>	A-12 4 78	B-12 67	C- 2 7	D-
Board of W&A Resources		B-12 67		
<u>WATER SUPPLY</u>				
<u>Agricultural</u>	B-123 7	B-12 67	A- 2 78	A- 2 4
Dept. of Agriculture		B-1		
Soil & Water Conservation Com.		B-12 78		
Board of W&A Resources		C-12 78		
<u>Domestic</u>	B-123 7	B-12 67	A- 2 4 78	A- 2 4
Board of Health-SED		B-12 67		
Board of W&A Resources		B-12		
Univ. of N.C.-School of P.H.		B-1 5 8		
<u>Industrial</u>	B-12 7	B-12 67	B- 2	A- 2 4
Board of W&A Resources		B-12 678		
Board of C&D-Com. & Ind.		B-1 78		
Univ. of N.C.-Ind. Ext. Service		C-1 5 8		

TABLE S - 3

PURPOSE AND PERTINENT NORTH CAROLINA STATE AGENCIES	FEDERAL	STATE	LOCAL	PRIVATE
<u>Municipal</u>	B-123	7	B-12 67	A- 2 4 78 C- ^b
Board of Health-SED			B-12 67	
Board of W & A Resources			B-123 7	
Utilities Commission			B- 6	
Local Government Commission			B- 6	
Univ. of N.C. - School of Public Health			B-1 5 8	
<u>WATERSHED PROTECTION MANAGEMENT</u>	B-123	78	B-12 678	A- 2 4 78 D-
Board of W & A Resources			B-12 678	
Dept. of Agriculture			B-12 5 78	
Soil and Water Cons. Com.			A-123 5 78	
UNC-Agr. Ext. Serv.			B-1 5 8	
<u>SPECIAL^g</u>				
Dept. of Admin., Emergency Planning Office			A-12 78	
Dept. of Admin., State Planning Task Force Division			C-12 78	
Univ. of N.C. - Water Resources Research Institute			A-1 5 8	
Institute of Government			A-1 5 8	

^a This table, as adapted in principle from a draft of the Ohio River Basin Comprehensive Survey Report, omits a Regional column, covering governmental agencies which include more than one state on the assumption that this is not currently of great significance in North Carolina. TVA and ARC are considered Federal agencies. A River Basin Commission, under Title II, WRPA, would be considered Regional. It is important to remember that this table is an attempt to place nuances of responsibility and function into tabular form for purposes of perspective. It must not be interpreted as precise, or as limiting activities of agencies included or omitted. Water is of such universal significance that some interest or responsibility inheres in most organizations.

^b Some municipal water systems operated by privately-owned utilities.

^c Construction and operation by port facilities is usually a local function regulated by State laws, but the major facilities in North Carolina are a State function.

^d Power Marketing.

^e Primary concern of private interests.

^f Significance increasing.

^g These agencies either have a general responsibility which covers the whole spectrum of water resources in a broadly coordinative sense or a special responsibility related to each of the sub-divisions.

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ACKNOWLEDGEMENTS

This overview has been prepared by the Planning Division, Department of Water and Air Resources, with the help of staff members of each of the other water divisions: Water Management, Waterways and Seashores, Water Pollution Control, and Ground Water.

Draft copies have been furnished to the following for comment or advance information, as well as to a number of other individuals. Extensive comments and assistance have been received from several of these agencies, and are on file with the file copy of the full-length report which is being retained in the Department.

State Planning Task Force, Administrative Office
Field Coordinators, each Local Development District in Appalachia
Department of Conservation and Development
North Carolina Recreation Commission
Wildlife Resources Commission
North Carolina State Soil and Water Conservation Committee
Sanitary Engineering Division, State Board of Health
Water Resources Research Institute (Mr. Howells)
Institute of Government (Mr. Heath)
Rummel, Klepper and Kahl
Tennessee Valley Authority
Office of Appalachian Studies, Cincinnati, Ohio
Resources Advisory Board, Southeast River Basins
Water Resources Council, Office of Executive Director
U.S. Army Engineer District, Charleston
U.S. Army Engineer District, Huntington
U.S. Geological Survey, Raleigh Office
U.S. Soil Conservation Service, North Carolina Conservationist

The comments received were largely informal and advisory, and this Department does not wish to imply that listing these agencies constitutes endorsement of the content of the report by them.

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II. SPECIAL TECHNICAL STUDIES

AN ANALYSIS OF THE INTERRELATIONSHIP BETWEEN THE WATER RESOURCES OF THE NORTH CAROLINA APPALACHIAN REGION AND THE REGIONAL ECONOMIC DEVELOPMENT POTENTIAL BASED UPON COMPREHENSIVE DEVELOPMENT OF ITS WATER RESOURCES

(Work Elements of an Engineering and Economic Study Currently Underway)

The Consultant agrees to perform the required professional engineering services, including studies, investigations, and other work, as set forth herein in conjunction with an analysis of the interrelationship between the water resources of the North Carolina Appalachian Region, the regional economic development potential based upon comprehensive development of its water resources, and the ability to pay status of the local governmental bodies. This study is to be concentrated on those areas in close proximity to the planned Appalachian Development Corridors and/or the planned Interstate Highway System within Appalachian North Carolina.

1. Description of Work

The work covered by this agreement and to be accomplished by the Consultant consists of the following:

A. Study Areas

One major area has been agreed upon for study by the Consultant in each of the seven Development Districts set forth in "Investment Guidelines for the North Carolina Appalachian Region," by Hammer, Greene, Siler Associates. These are:

- (a) Development District I - The Murphy-Andrews Corridor
- (b) Development District II - The Asheville-Hendersonville Corridor
- (c) Development District III - The Rutherfordton-Spindale-Forest City Corridor
- (d) Development District IV - The Community of Boone
The Community of Spruce Pine
- (e) Development District V - The Morganton-Valdese-Hickory Corridor
- (f) Development District VI - The Wilkesboro-Elkin-Jonesville Corridor
- (g) Development District VII - The Winston-Salem - Kernsville Corridor

B. Services

The services which will be performed by the Consultant will take the following sequences (on page 2):

1. Preliminary Study

(a) Confer and establish liaison with all State agencies having a valid interest in the subject; to discuss broad criteria of the study; and investigate sources of available material. A representative, but not limiting roster of such agencies includes the State Planning Task Force; Department of Conservation and Development; State Stream Sanitation Committee; Department of Water and Air Resources; Board of Health; State Highway Commission; and Department of the Treasurer; political subdivision governing bodies at county and municipal levels will be apprised of the project, and their cooperation requested.

(b) Subsequent to initial conferences and review of available material, undertake initial field investigation of each study corridor to corroborate existing record information, and, where indicated, to provide the basis for re-evaluation of this data.

2. Growth Potential

(a) Study individual and multilateral growth potential of communities lying within study corridors. Criteria will include:

1. Existence of residential, industrial nuclei
2. Make-up and vigor of present economy
3. Past in-migration and ex-migration history
4. Suitability of topography for future development
5. Transportation facilities
6. Available labor pool
7. Availability of utilities

(b) Project residential and industrial growth which individual study areas can accommodate by 1970, 1980, and 2015. Then projections shall be consistent with land-use plans, community, and county plans where they exist.

(c) Project per capita incomes and area-wide assessed valuation. It should be noted that water and sewerage facilities are causative of, as well as responsive to, area growth. To the extent necessary, therefore, Item 2 - Growth Potential, will be undertaken simultaneously with Item 3 - Definition of Water Resources Potential.

To define the limits of this study, the year 2015 will be considered the target year for "ultimate" development. Each study area will be projected to this date unless probable saturation growth can be demonstrated to occur earlier.

3. Definition of Water Resource Potential

(a) From USGS maps and available photogrammetry, develop comprehensive sanitary drainage districts and companion water service areas within/or embracing growth corridors.

(b) Where topography, existing watercourses, and systems in use indicate potential for surface water supply, perform hydrological studies to determine maximum safe yield under limiting impoundment criteria, as well as probable treatment requirements. Riparian rights of downstream users will be considered.

Where the potential for surface supplies is not apparent, investigate ground water records of the Geological Survey of the United States Department of Interior, as well as those of the companion agency of the State of North Carolina, to determine maximum safe yield and probable treatment requirements.

(c) From watercourse runoff data, coordinated with mandatory water quality standards of the State of North Carolina, determine waste assimilative capacity of major watercourses within each projected sanitary district.

(d) Determine general routes and broad locations for major water and sewerage facilities within each drainage district and water service area to serve projected growth areas.

(e) Evaluate existing water and sewerage facilities to determine feasibility of incorporating major elements within projected regional systems.

(f) Prepare preliminary estimates of cost for construction of ultimate regional water and sewerage systems within each drainage district and water service area. These estimates will take cognizance of the inflationary trend in construction costs and will represent, in effect, projected average costs at some reasonable future date. Projected Federal assistance will be based upon established grant programs administered by the Department of the Interior (P.L. 84-660, Quality Control Act of 1965; the Appalachian Regional Commission (P.L. 89-4, Appalachian Regional Development Act of 1965); the Department of Housing and Urban Development (P.L. 89-117, Housing and Urban Development Act of 1965); the Department of Commerce (P.L. 89-136, Public Works and Economic Development Act of 1965); the Department of Agriculture (P.L. 89-240, Consolidated Farmers Home Administration Act of 1961, Amendments) and others which may be appropriate.

(g) Project estimated annual capital and operating costs for ultimate water and sewerage systems to serve study areas.

4. Economic Correlation Parameters

(a) Project additional growth which each study area can presently support with existing water and sewerage facilities, i.e., without additional capital expenditure for utilities.

(b) Project additional water and sewerage construction which can be supported by each study area without exceeding present bonded indebtedness limitations, and relate such additional water and sewerage capacity to further growth which it can serve.

(c) Relate ultimate water and sewerage capabilities of each sanitary and drainage district to projected residential and industrial growth as determined under Item 2 above.

(d) Project allowable growth per unit of expenditure for water and sewer chargeable to each study area. Relate such costs to existing and projected assessed valuation for economic feasibility.

(e) Study available sources of revenue within each study area to determine economic feasibility of water and sewerage construction, in relation to projected assessed valuation. Sources of revenue studies will be ad valorem tax, service charge, front foot assessment, area connection charge, and others. Relate projected annual charges per user to per capita income, present and projected, within each study area.

5. Report

(a) These findings will be compiled in a report to the State Planning Task Force, providing a profile of each growth area, indicating dollar investment in utilities per unit of potential growth, total annual costs of water and sewerage facilities with respect to projected assessed valuation within each study area, and total annual user costs with respect to per capita annual income.

Specifically, the report will include the following:

(1) An outline analysis of the resources and capabilities for economic development of each of the seven areas (corridors) studied, with primary emphasis on water resources, waste disposal, and the ability of each area to finance public utility projects required to support economic development;

(2) an assessment of the economic growth potential, based upon comprehensive development of its water resources of each area studied, with emphasis upon major influencing factors, and a summary of net or optimum development potential;

(3) A comparison of the economic growth potentials of all study areas in a manner that will permit a ready and logical

assignment of relative area priorities for further economic development study and planning;

(4) an indication of limitations as to type or pattern of economic development within each area; based upon comprehensive development of water resources; and

(5) the framework of a phased plan for developing regional water and sewerage facilities to serve all areas based on their ultimate growth potentials to the year 2015. This will include schematic drawings showing general routes and locations of major facilities, preliminary estimates of costs for constructing regional water and sewerage systems within each proposed drainage district and water service area, and suggested methods of financing construction projects.

From the data thus presented, the State Planning Task Force may develop priorities based upon maximum growth which can be stimulated per unit of cost for necessary supporting utilities.

(b) The Consultant will submit findings of the study in the form of an interim report to State Planning Task Force for review and comment, following which the final report will be printed, including mutually agreeable modifications, all maps, tables, charts, and other significant material. One hundred (100) copies will be delivered to the State Planning Task Force.

6. General

(a) To confirm the general agreement reached in our July 13, 1967 Conference, pertaining to the scope and limitations of the work, it should be stressed that the report as submitted will not provide specific design details of fixed alignments of proposed utility systems; these determinations should be made in subsequent and more detailed studies.

(b) Monthly progress meetings will be held with the State Planning Task Force or designated representatives to report progress as well as to request basic information needs. A written monthly progress report will be submitted to the State Planning Task Force at each monthly progress meeting, along with a signed requisition in triplicate for any partial payment due under the terms of Section IV of this agreement. Liaison will be developed for information requests between monthly progress meetings.

(c) To the extent that the services of economic consultants may be required during the conduct of this study, the Consultant will engage Hammer, Greene, Siler Associates of Washington, D.C., because of that firm's familiarity with the study area.

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Figure 1

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TABLE 1

STUDY AREA: MURPHY-ANDREWS CORRIDOR

County: Cherokee

Local Development District: Southwestern Mountain Region

Population & Employment Projections:

Year:	1965 (Estimated)	1990	2015
Population:	3,900	6,000	15,000
Employment:	3,800	6,000	14,000
Manufacturing Employment:	1,700	2,200	4,600

Major Industries: Textiles, apparel, furniture, mining

Ultimate¹ Commercial & Industrial Land Requirements (acres): 500

Land Suitable for Commercial & Industrial Use (acres): 1,100

Service Area Saturation Population: 31,000

Assessed Valuation Projections:

Year:	1967 (Estimated)	1990	2015
Assessed Valuation: ²	\$9,000,000	\$15,000,000	\$36,000,000

Annual Average Water Use Projections:

Year:	1965 (Estimated)	1990	2015
Per Capita (gpcd):	120	158	195
Total (mgd):	0.5	1.1	2.9

Annual Average Waste Loading Projections:

Year:	1965 (Estimated)	1990	2015
Hydraulic Loading (mgd):	0.5	1.1	2.9
Organic Loading (PE):	3,900	6,000	15,000

System Costs² (Design Year 2015)

<u>Item</u>	<u>Water³</u>	<u>Waste⁴</u>
Estimated Project Cost ⁵	\$6,886,000	\$4,206,000
Maximum Statutory Grant	5,500,000	3,370,000
Net Local Project Cost	1,386,000	836,000
Bond Issue	1,487,000	896,000
Annual Cost of Bond Issue	97,000	58,000
Annual Operating & Maintenance Cost	124,000	61,000
Total Annual Cost	221,000	119,000

¹ Same as design year 2015.

² Valuations & Cost Estimates are based on 1967 price levels.

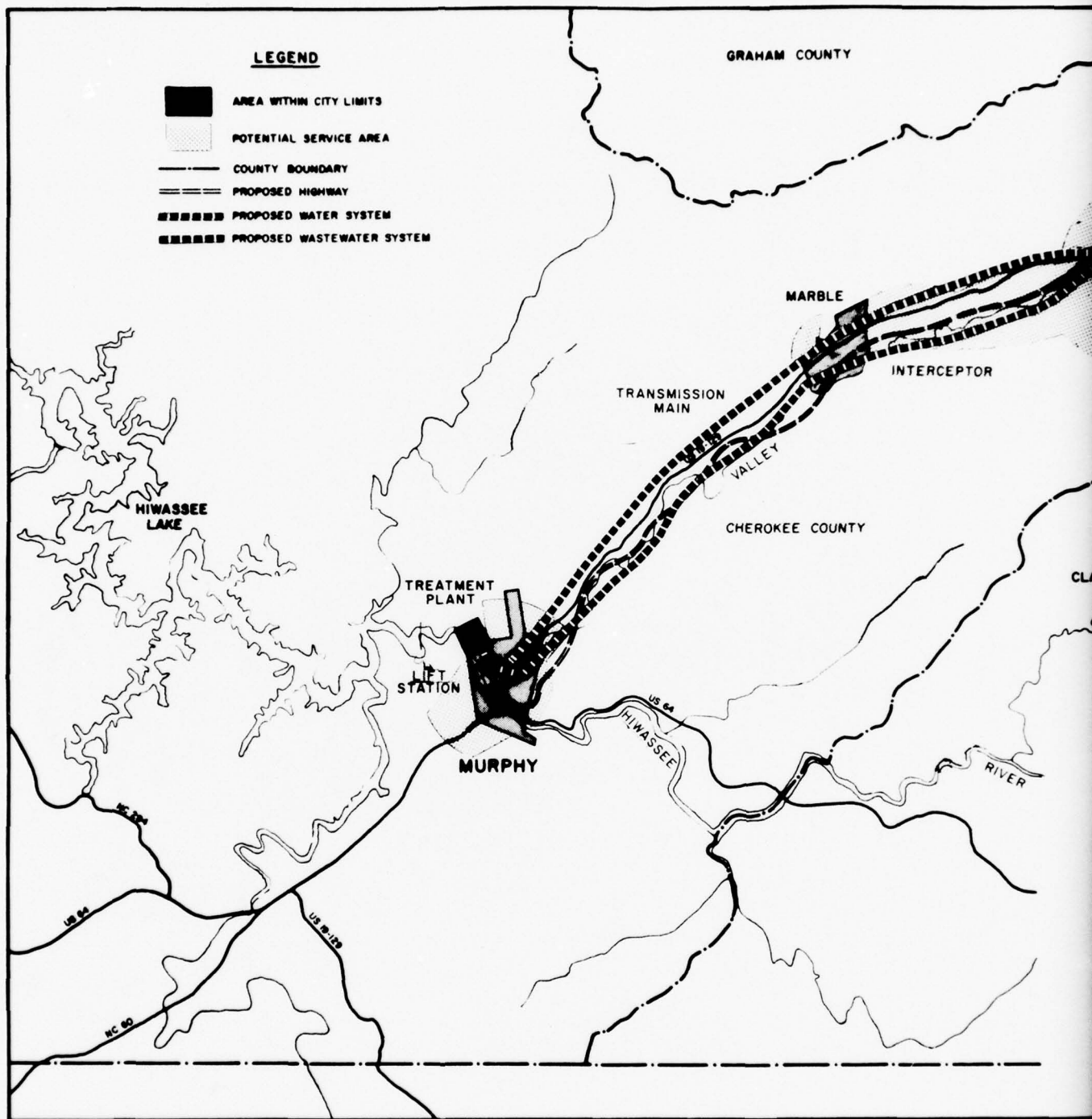
³ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.

⁴ Waste system is defined as major interceptors, major pumping stations, and treatment facilities.

⁵ Project cost includes cost of construction, engineering and contingencies.

⁶ Operating and maintenance costs are averaged over the 50-year design period.

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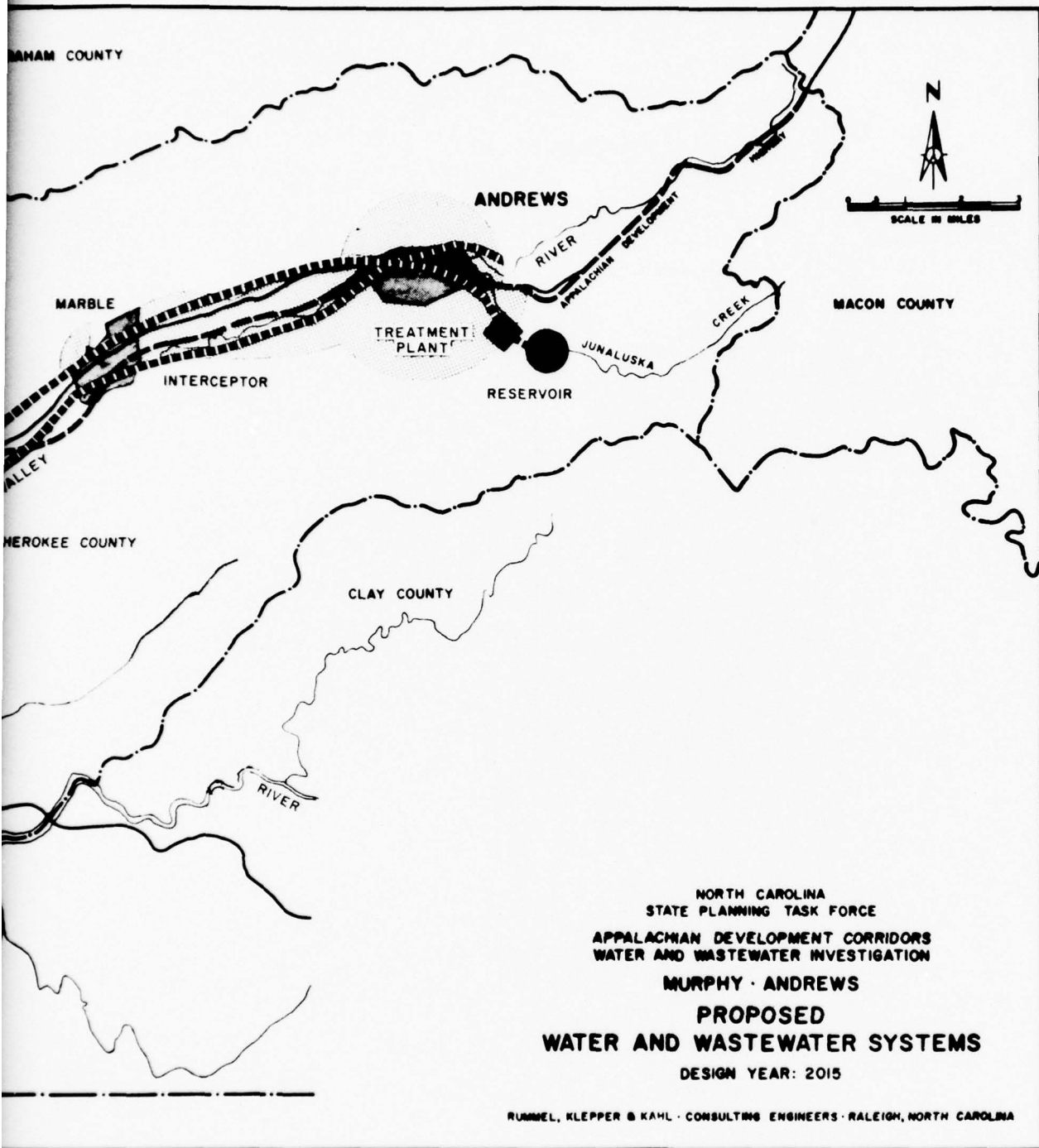


Figure 2

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PRELIMINARY

TABLE II

STUDY AREA: NORTH WILKESBORO-WILKESBORO-
ELKIN-JONESVILLE CORRIDOR

Counties: Wilkes, Surry, Yadkin

Local Development District: Blue Ridge Region
Northwest Region

Population & Employment Projections:

Year:	1965 (Estimated)	1990	2015
Population:	21,000	34,000	77,000
Employment:	21,000	37,000	67,000
Manufacturing Employment:	9,200	17,000	31,000

Major Industries: Textiles, apparel, furniture, food processing,
electrical equipment, leather products, stone,
clay and glass products

Ultimate¹ Commercial & Industrial Land Requirements (acres): 2,600

Land Suitable for Commercial & Industrial Use (acres): 7,000

Service Area Saturation Population: 180,000

Assessed Valuation Projections:

Year:	1967 (Estimated)	1990	2015
Assessed Valuation ² :	\$70,000,000	\$122,000,000	\$252,000,000

Annual Average Water Use Projections:

Year:	1965 (Estimated)	1990	2015
Per Capita (gpcd):	260	274	291
Total (mgd):	5.5	9.3	22.4

Annual Average Waste Loading Projections:

Year:	1965 (Estimated)	1990	2015
Hydraulic Loading (mgd):	5.5	9.3	22.4
Organic Loading (PE):	90,000	160,000	320,000

System Costs² (Design Year 2015)

Item	Water ³	Waste ⁴
Estimated Project Cost ⁵	\$18,390,000	\$13,010,000
Maximum Statutory Grant	14,710,000	10,410,000
Net Local Project Cost	3,680,000	2,600,000
Bond Issue	3,940,000	2,790,000
Annual Cost of Bond Issue	256,000	181,000
Annual Operating & Maintenance Cost ⁶	834,000	252,000
Total Annual Cost	1,090,000	433,000

¹ Same as design year 2015.

² Valuations & Cost Estimates are based on 1967 price levels.

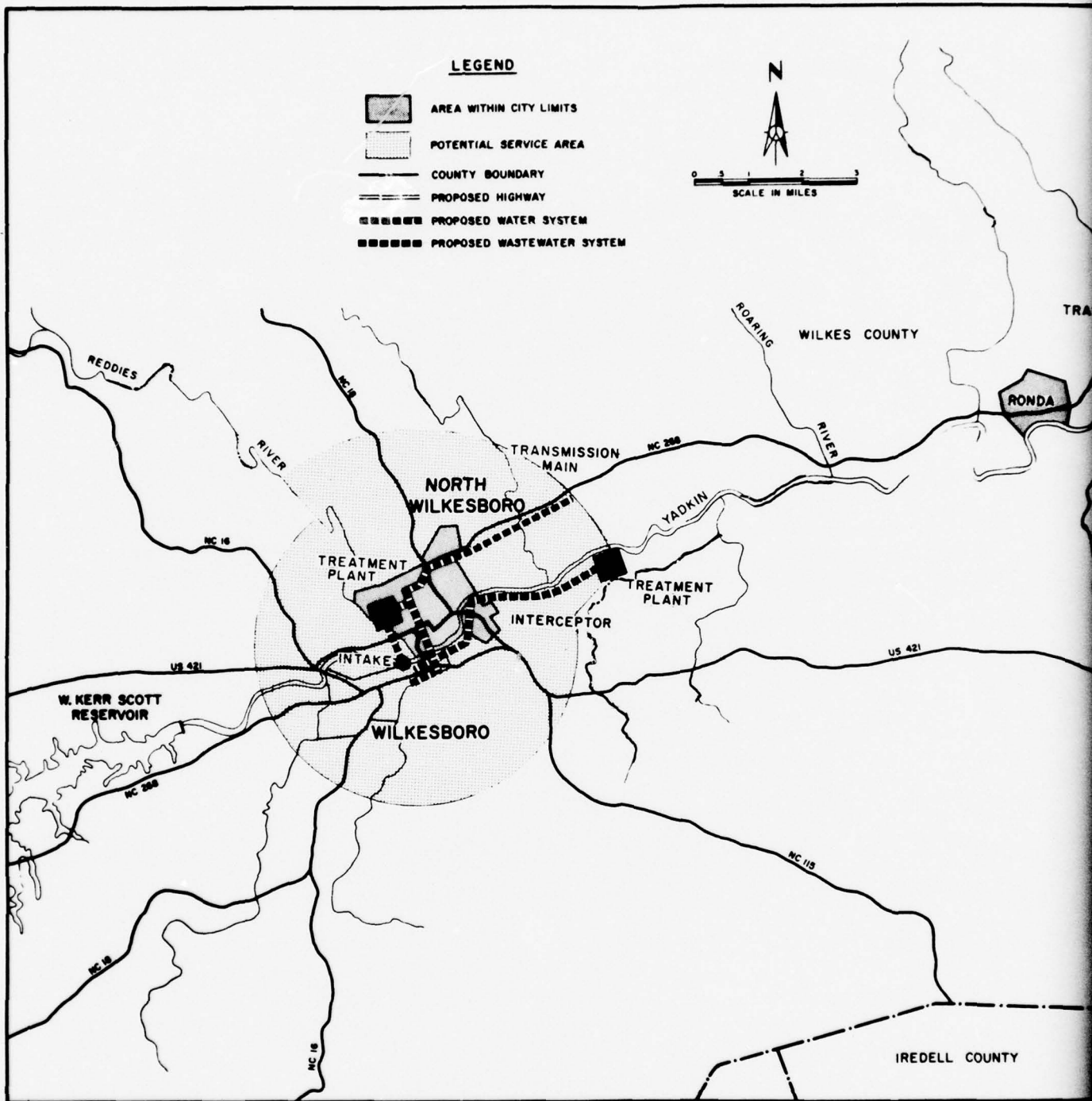
³ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.

⁴ Waste system is defined as major interceptors, major pumping stations, and treatment facilities.

⁵ Project cost includes cost of construction, engineering and contingencies.

⁶ Operating and maintenance costs are averaged over the 50-year design period.

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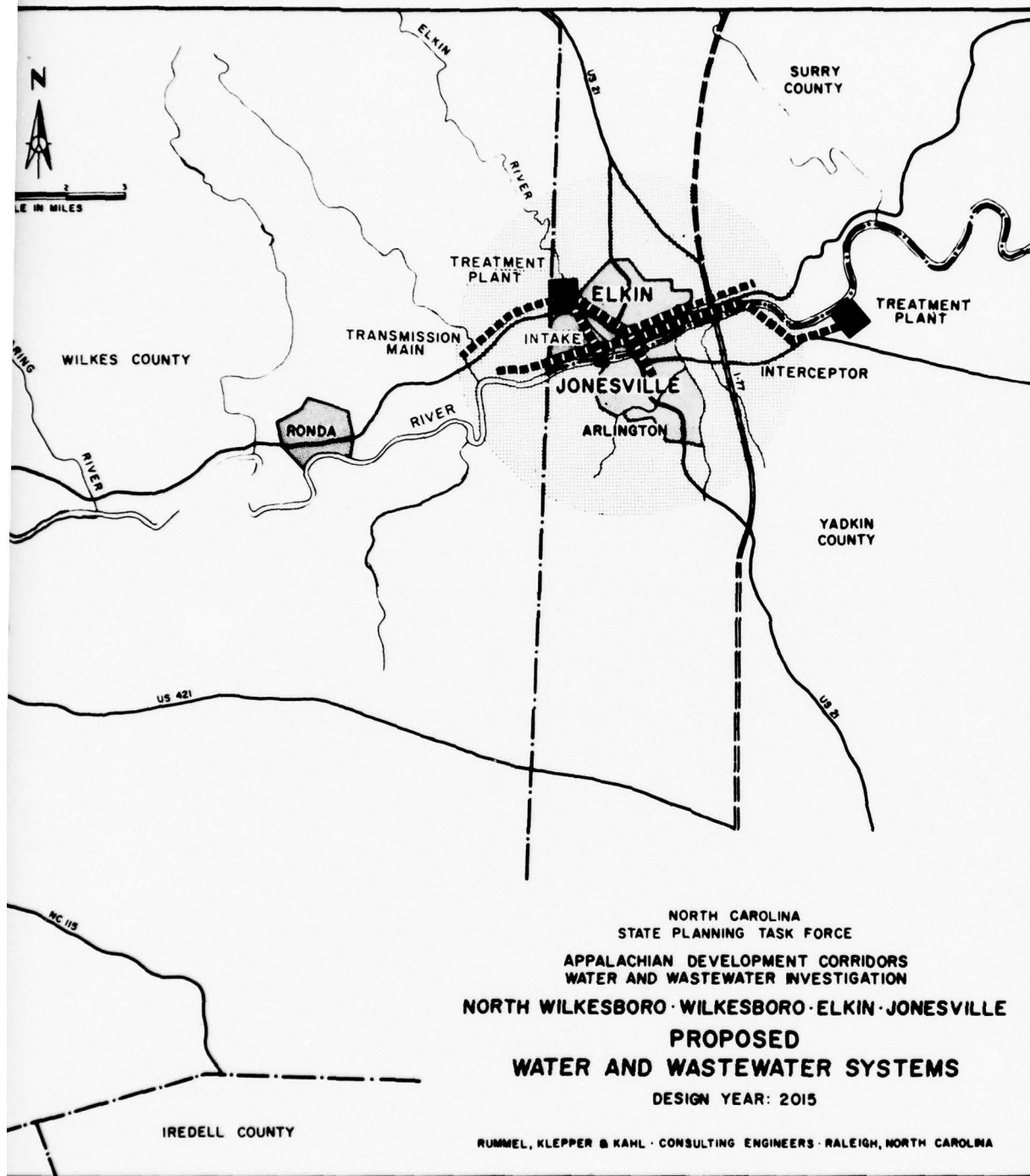


Figure 3

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TABLE III

STUDY AREA: BOONE

County: Watauga

Local Development District: Mountain Scenic Region

Population, Employment, and A.S.U. Enrollment Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Total Population (Incl. A.S.U. enrollment residing in service area):	6,800	15,000	20,000
Appalachian State Univ. Enrollment Residing in Service Area:	3,200	10,000	16,000
Net Population (Excl. A.S.U.):	3,600	5,000	13,000
Employment:	4,300	4,500	8,000
Manufacturing Employment:	1,100	1,200	1,500
Appalachian State University Enrollment:	4,000	13,000	20,000

Major Industries: apparel, leather products, electrical supplies, fabricated metal products.

Ultimate¹ Commercial & Industrial Land Requirements (acres): 150

Land Suitable for Commercial & Industrial Use (acres): 600

Service Area Saturation Population: 30,000

Assessed Valuation Projections:

Year:	<u>1967 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Assessed Valuation: ^{2,3}	\$14,000,000	\$20,000,000	\$43,000,000

Annual Average Water Use Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Per Capita (gpcd):	119	140	170
Total (mgd):	0.8	2.1	5.1

Annual Average Waste Loading Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Hydraulic Loading (mgd):	0.8	2.1	5.1
Organic Loading (PE):	6,800	15,000	20,000

System Costs² (Design Year 2015)

Item	<u>Water⁴</u>	<u>Waste⁵</u>
Estimated Project Cost ⁶	\$7,620,000	\$3,730,000
Maximum Statutory Grant	6,100,000	2,990,000
Net Local Project Cost	1,520,000	750,000
Bond Issue	1,630,000	800,000
Annual Cost of Bond Issue	106,000	52,000
Annual Operating & Maintenance Cost ⁷	211,000	67,000
Total Annual Cost	317,000	119,000

¹ Same as design year 2015.

² Valuations & Cost Estimates are based on 1967 price levels.

³ Excludes Appalachian State University Valuation.

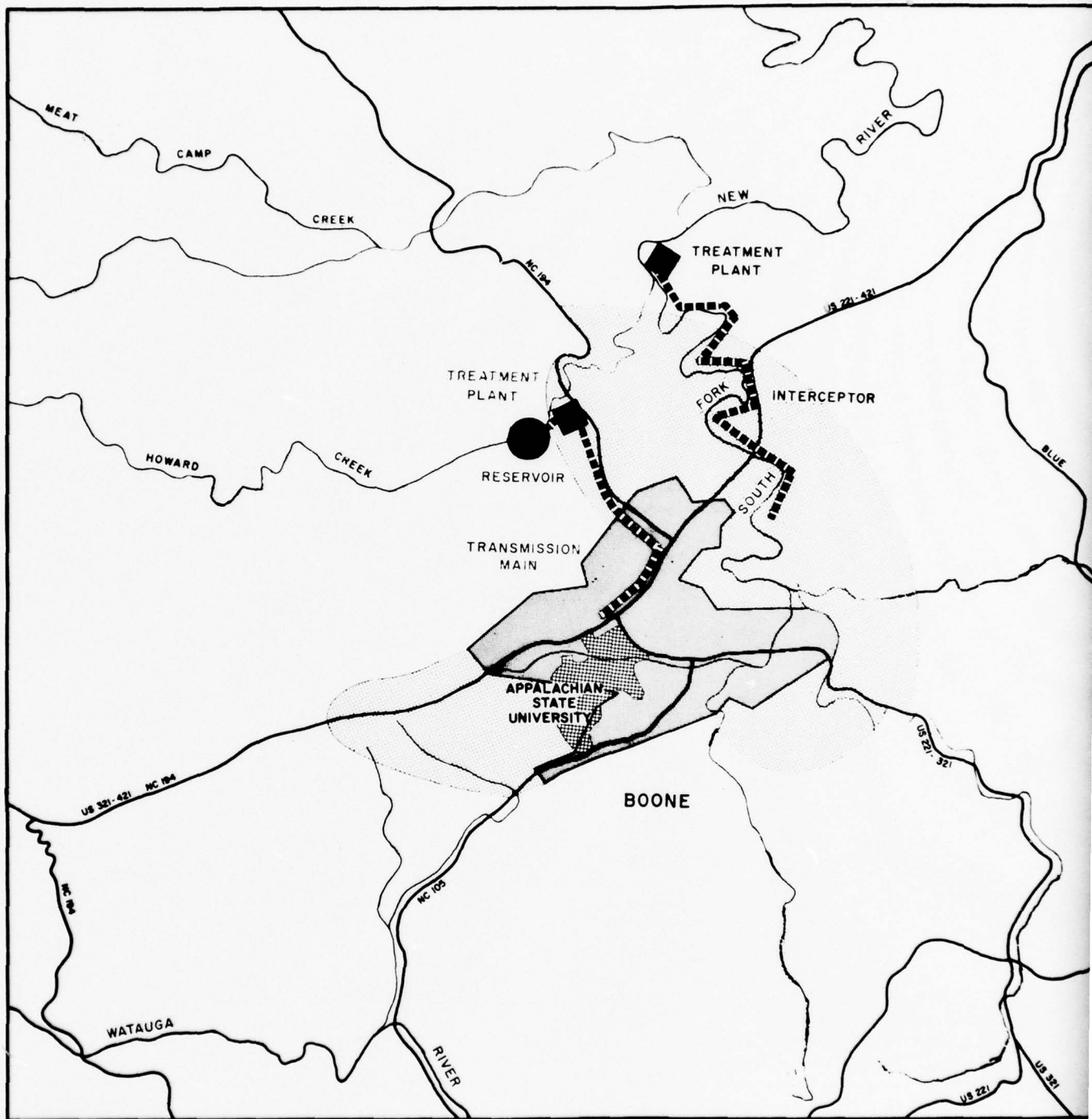
⁴ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.

⁵ Waste system is defined as major interceptor, major pumping stations, and treatment facilities.

⁶ Project cost includes cost of construction, engineering, and contingencies.

⁷ Operating and maintenance costs are averaged over the 50 year design period.

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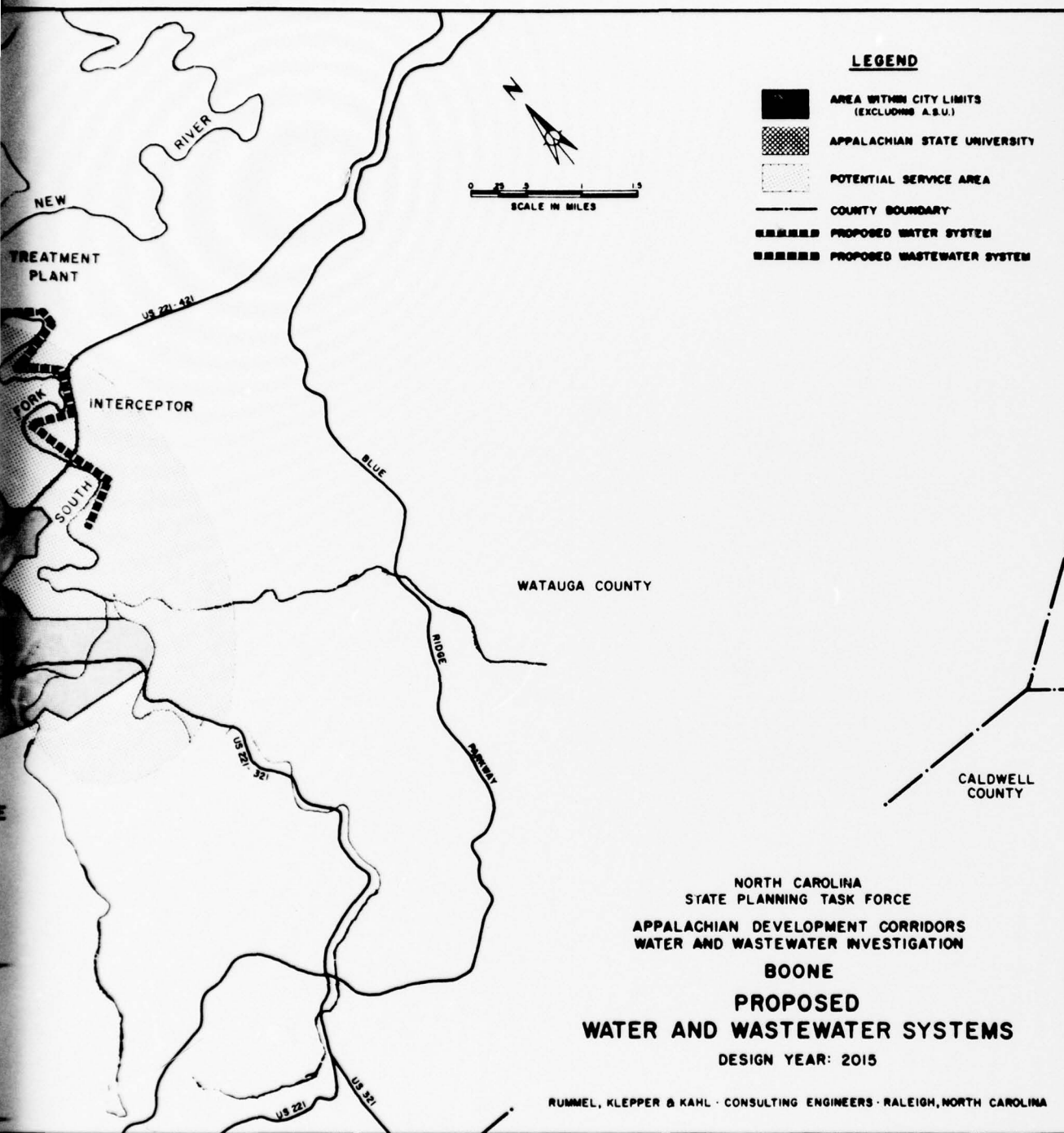


Figure 4

PRELIMINARY

TABLE IV

STUDY AREA: SPRUCE PINE

County: Mitchell

Local Development District: Mountain Scenic Region

Population & Employment Projections:

Year:	1965 (Estimated)	1990	2015
Population:	4,100	6,000	16,000
Employment:	5,500	8,000	18,000
Manufacturing Employment:	1,000	3,000	6,000

Major Industries: Textiles, apparel, furniture, mineral processing

Ultimate¹ Commercial & Industrial Land Requirements (acres): 600

Land Suitable for Commercial & Industrial Use (acres): 1,200

Service Area Saturation Population: 27,000

Assessed Valuation Projections:

Year:	1967 (Estimated)	1990	2015
Assessed Valuation ² :	\$8,000,000	\$16,000,000	\$37,000,000

Annual Average Water Use Projections:

Year:	1965 (Estimated)	1990	2015
Per Capita (gpcd):	120	158	165
Total (mgd):	0.5	1.0	3.2

Annual Average Waste Loading Projections:

Year:	1965 (Estimated)	1990	2015
Hydraulic Loading (mgd):	0.5	1.0	3.2
Organic Loading (PE):	4,100	6,000	16,000

System Costs² (Design Year 2015)

Item	Water ³	Waste ⁴
Estimated Project Cost ⁵	\$3,070,000	\$3,320,000
Maximum Statutory Grant	2,460,000	2,660,000
Net Local Project Cost	610,000	660,000
Bond Issue	660,000	710,000
Annual Cost of Bond Issue	43,000	46,000
Annual Operating & Maintenance Cost ⁶	118,000	45,000
Total Annual Cost	161,000	91,000

¹ Same as design year 2015.

² Valuations & Cost Estimates are based on 1967 price levels.

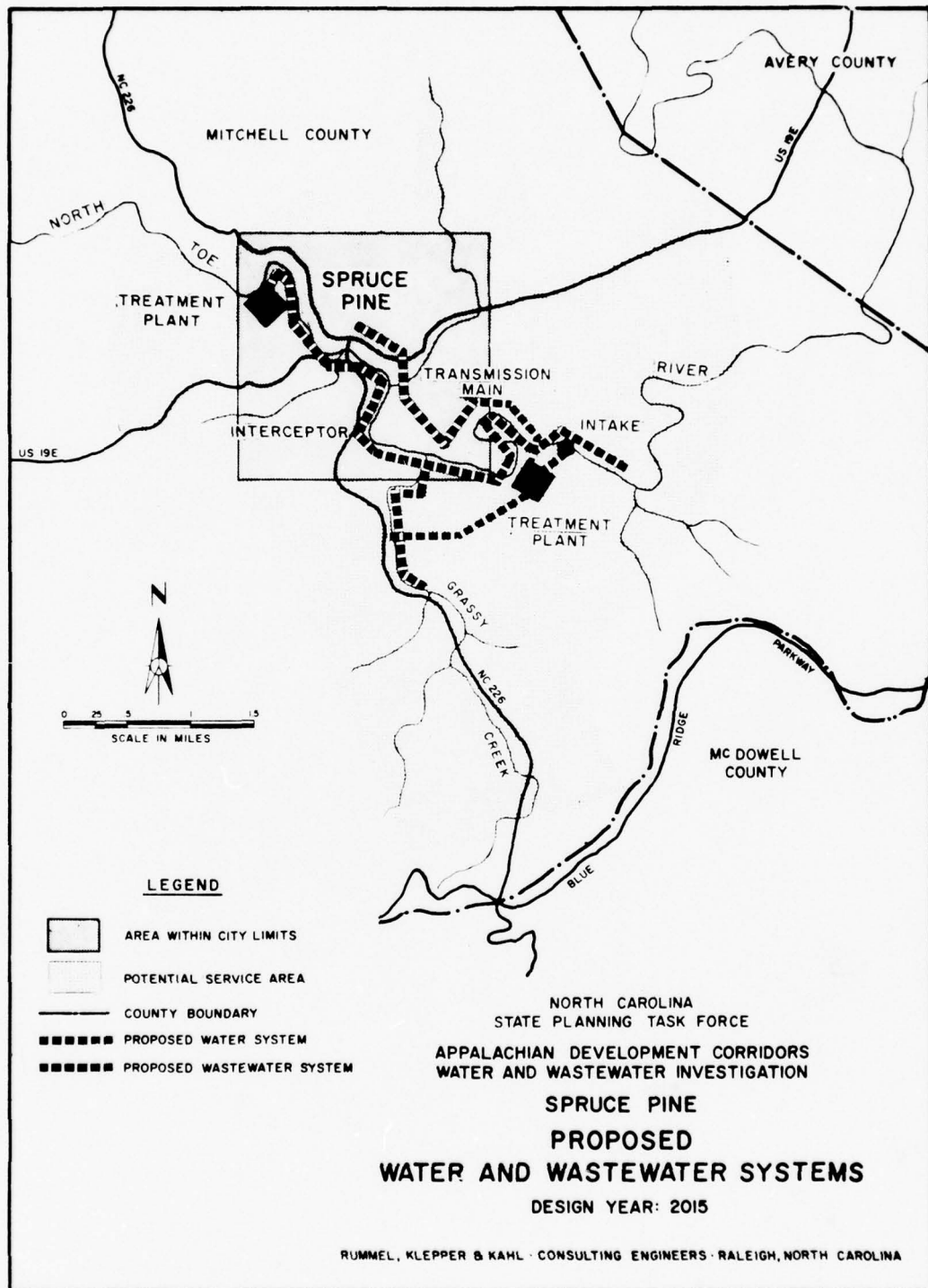
³ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.

⁴ Waste system is defined as major interceptors, major pumping stations, and treatment facilities.

⁵ Project cost includes cost of construction, engineering and contingencies.

⁶ Operating and maintenance costs are averaged over the 50-year design period.

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PRELIMINARY

Figure 5

PRELIMINARY

TABLE V

STUDY AREA: RUTHERFORDTON-SPINDALE-FOREST CITY CORRIDOR

County: Rutherford

Local Development District: Isothermal Region

Population & Employment Projections:

Year:	1965 (Estimated)	1990	2015
Population:	31,000	48,000	100,000
Employment:	16,000	26,000	49,000
Manufacturing Employment:	8,800	12,000	20,000

Major Industries: textiles, apparel, furniture

Ultimate¹ Commercial & Industrial Land Requirements (acres): 1700

Land Suitable for Commercial & Industrial Use (acres): 2400

Service Area Saturation Population: 400,000

Assessed Valuation Projections:

Year:	1967 (Estimated)	1990	2015
Assessed Valuation: ²	\$60,000,000	\$100,000,000	\$200,000,000

Annual Average Water Use Projections:

Year:	1965 (Estimated)	1990	2015
Per Capita (gpd):	332	354	340
Total (mgd):	10.3	17.0	36.6

Annual Average Waste Loading Projections:

Year:	1965 (Estimated)	1990	2015
Hydraulic Loading (mgd):	10.3	17.0	36.6
Organic Loading (PB):	100,000	150,000	280,000

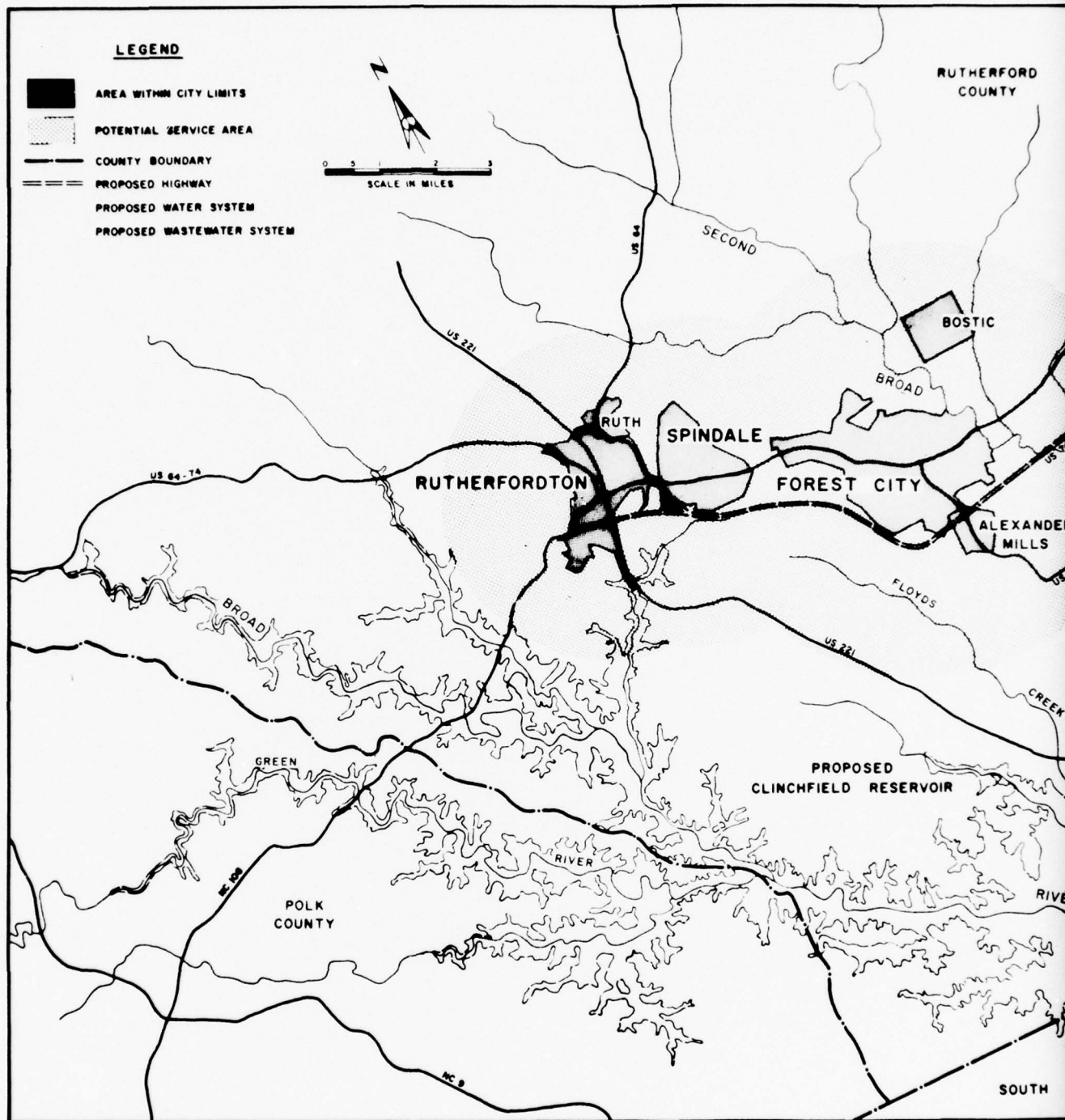
System Costs² (Design Year 2015)

Item	Water ³	Waste ⁴
Estimated Project Cost ⁵		
Maximum Statutory Grant		
Net Local Project Cost		
Bond Issue		
Annual Cost of Bond Issue		
Annual Operating & Maintenance Cost ⁶		
Total Annual Cost		

(Table to be completed at a later date)

- 1 Same as design year 2015
- 2 Valuations are based on 1967 price levels.
- 3 Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.
- 4 Waste system is defined as major interceptors, major pumping stations, and treatment facilities.
- 5 Project cost includes cost of construction, engineering and contingencies.
- 6 Operating and maintenance costs are averaged over the 50 year design period.

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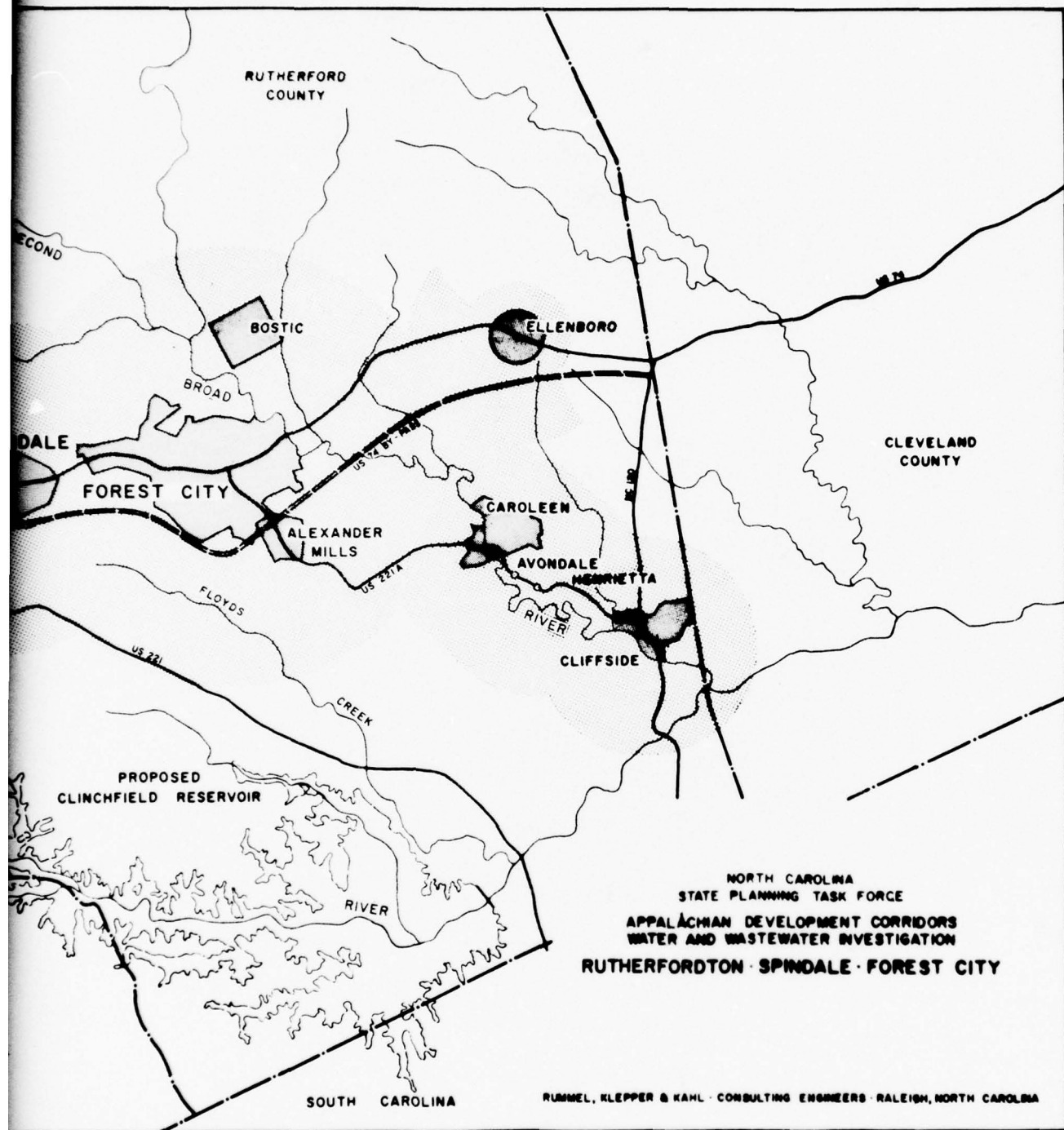


Figure 6

PRELIMINARY

TABLE VI

STUDY AREA: MORGANTON-VALDESE-HICKORY¹ CORRIDOR

Counties: Burke, Caldwell, Catawba¹

Local Development District: ABC Region

Population & Employment Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Population:			
Employment:			
Manufacturing Employment:			

Major Industries:

Ultimate² Commercial & Industrial Land Requirements (acres):

Land Suitable for Commercial & Industrial Use (acres):

Service Area Saturation Population:

Assessed Valuation Projections:

Year:	<u>1967 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Assessed Valuation: ³			

Annual Average Water Use Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Per Capita (gpcd):			
Total (mgd):			

Annual Average Waste Loading Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Hydraulic Loading (mgd):			
Organic Loading (PE):			

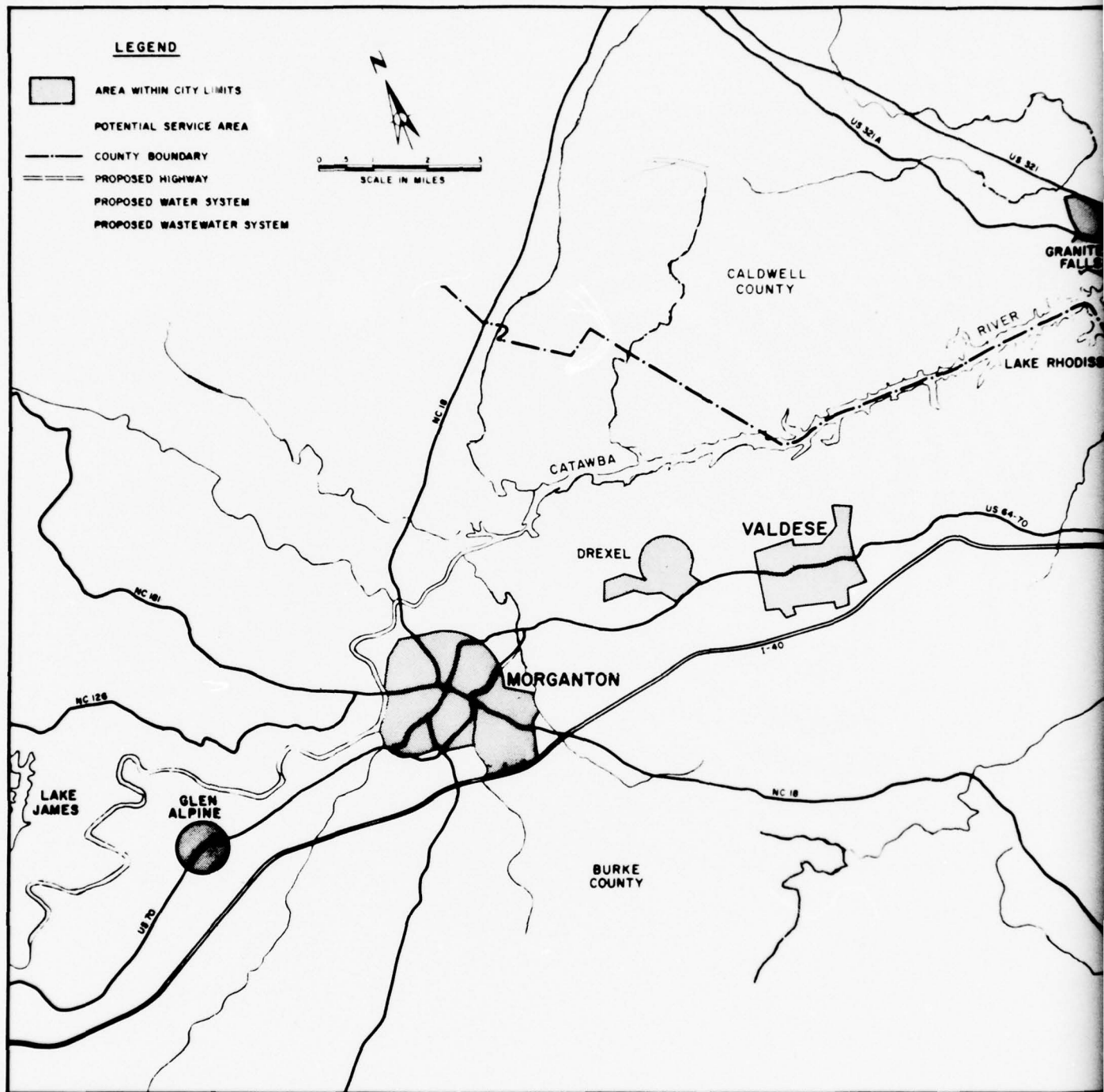
System Costs³ (Design Year 2015)

<u>Item</u>	<u>Water⁴</u>	<u>Waste⁵</u>
Estimated Project Cost ⁶		
Maximum Statutory Grant		
Net Local Project Cost		
Bond Issue		
Annual Cost of Bond Issue		
Annual Operating & Maintenance Cost ⁷		
Total Annual Cost		

(Table to be completed at a later date)

- 1 Not in Appalachia.
- 2 Same as design year 2015.
- 3 Valuations & Cost Estimates are based on 1967 price levels.
- 4 Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.
- 5 Waste system is defined as major interceptors, major pumping stations, and treatment facilities.
- 6 Project cost includes cost of construction, engineering and contingencies.
- 7 Operating and maintenance costs are averaged over the 50 year design period.

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PRELIMINARY

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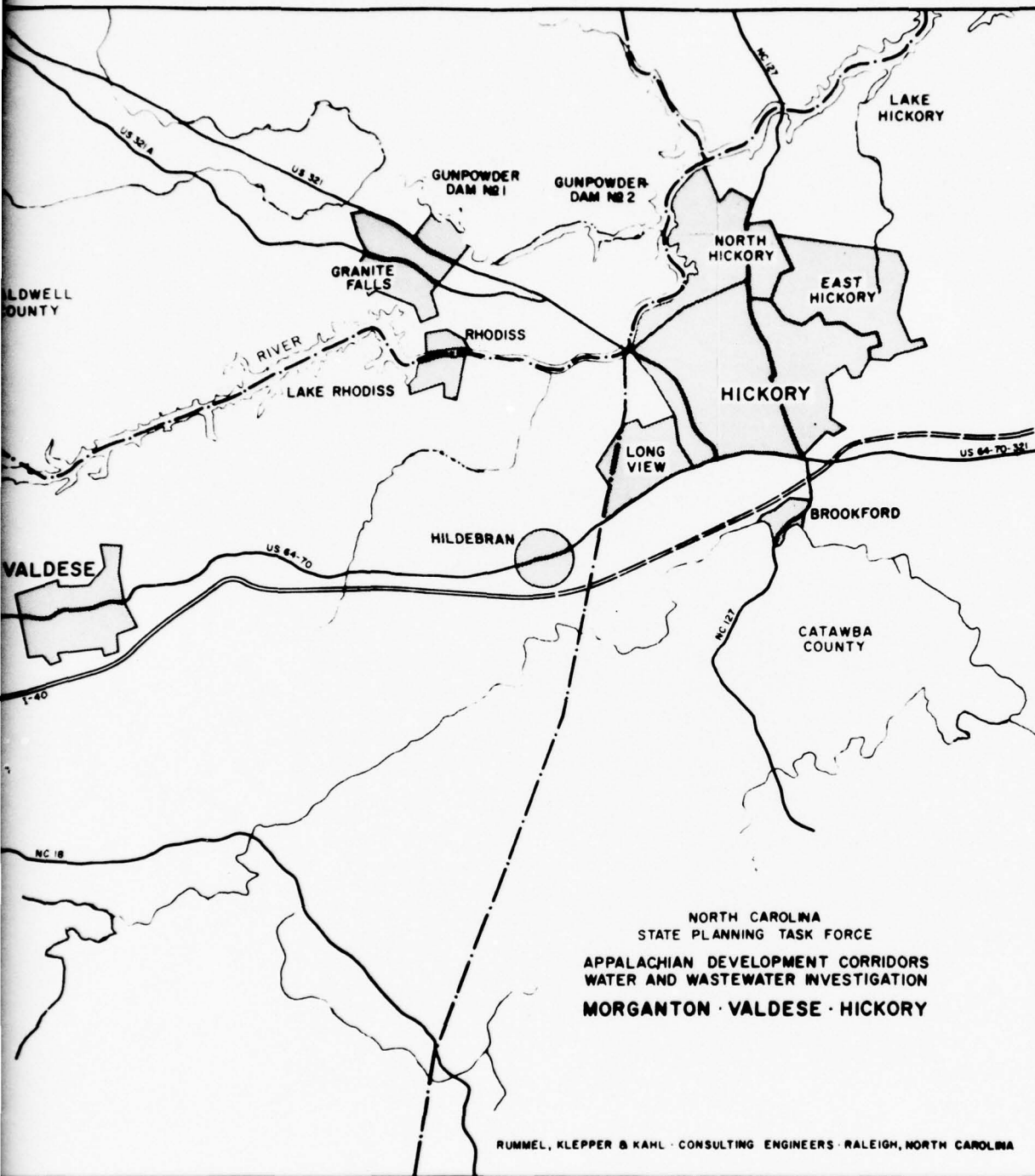


Figure 7

PRELIMINARY

TABLE VII

STUDY AREA: WINSTON-SALEM - KERNERSVILLE CORRIDOR

County: Forsyth

Local Development District: Northwest Region

Population & Employment Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Population:			
Employment:			
Manufacturing Employment:			

Major Industries:

Ultimate¹ Commercial & Industrial Land Requirements (acres):

Land Suitable for Commercial & Industrial Use (acres):

Service Area Saturation Population:

Assessed Valuation Projections:

Year:	<u>1967 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Assessed Valuation ² :			

Annual Average Water Use Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Per Capita (gpcd):			
Total (mgd):			

Annual Average Waste Loading Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Hydraulic Loading (mgd):			
Organic Loading (PE):			

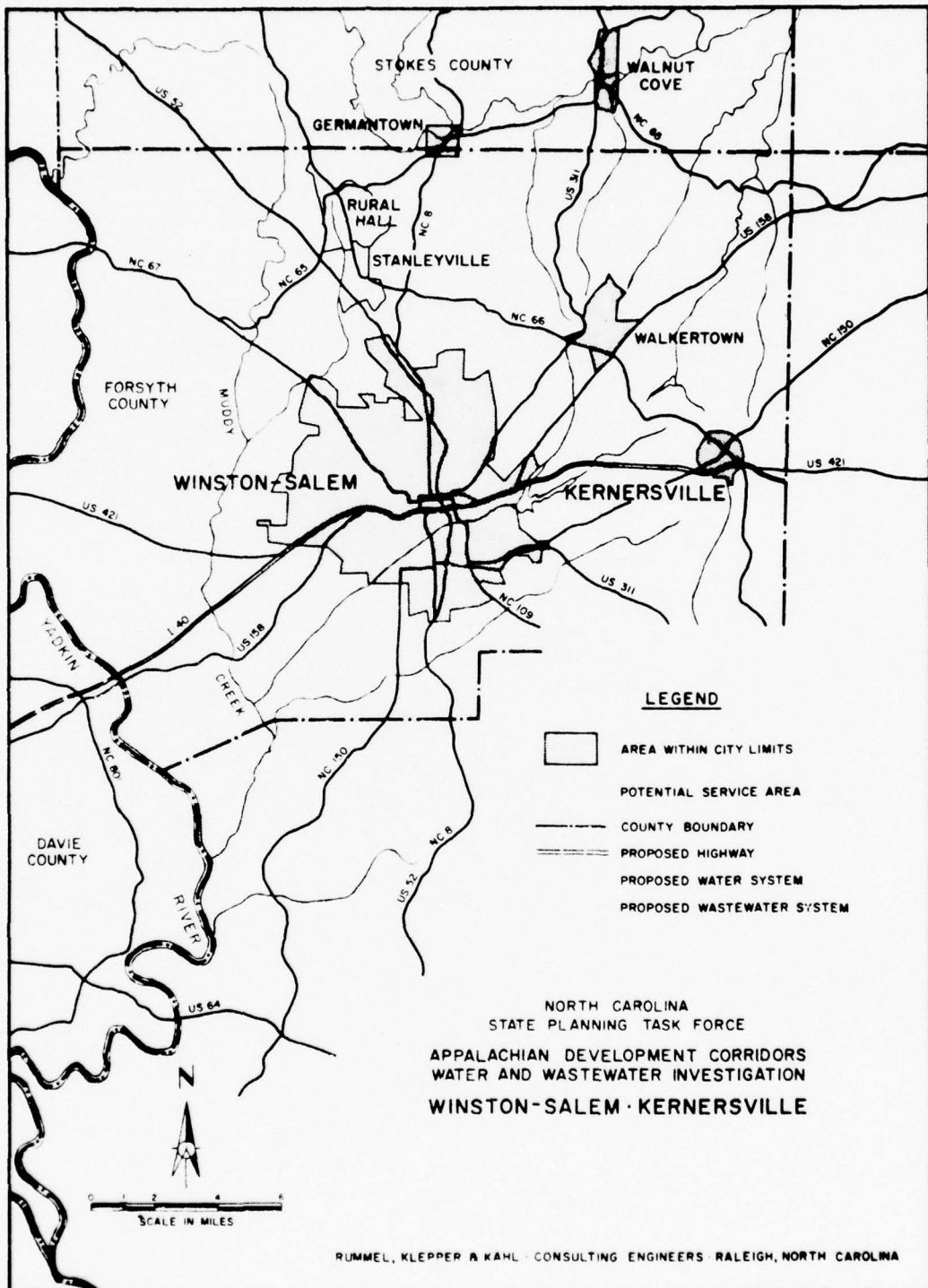
System Costs² (Design Year 2015)

<u>Item</u>	<u>Water</u> ³	<u>Waste</u> ⁴
Estimated Project Cost ⁵		
Maximum Statutory Grant		
Net Local Project Cost		
Bond Issue		
Annual Cost of Bond Issue		
Annual Operating & Maintenance Cost ⁶		
Total Annual Cost		

(Table will be completed at a later date)

- ¹ Same as design year 2015.
- ² Valuations & Cost Estimates are based on 1967 price levels.
- ³ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.
- ⁴ Waste system is defined as major interceptors, major pumping stations, and treatment facilities.
- ⁵ Project cost includes cost of construction, engineering and contingencies.
- ⁶ Operating and maintenance costs are averaged over the 50-year design period.

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PRELIMINARY

Figure 8

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PRELIMINARY

TABLE VIII

STUDY AREA: ASHEVILLE-HENDERSONVILLE CORRIDOR

Counties: Buncombe, Henderson

Local Development District: Upper French Broad Region

Population & Employment Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Population:			
Employment:			
Manufacturing Employment:			

Major Industries:

Ultimate¹ Commercial & Industrial Land Requirements (acres):

Land Suitable for Commercial & Industrial Use (acres):

Service Area Saturation Population:

Assessed Valuation Projections:

Year:	<u>1967 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Assessed Valuation ² :			

Annual Average Water Use Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Per Capita (gpcd):			
Total (mgd):			

Annual Average Waste Loading Projections:

Year:	<u>1965 (Estimated)</u>	<u>1990</u>	<u>2015</u>
Hydraulic Loading (mgd):			
Organic Loading (PE):			

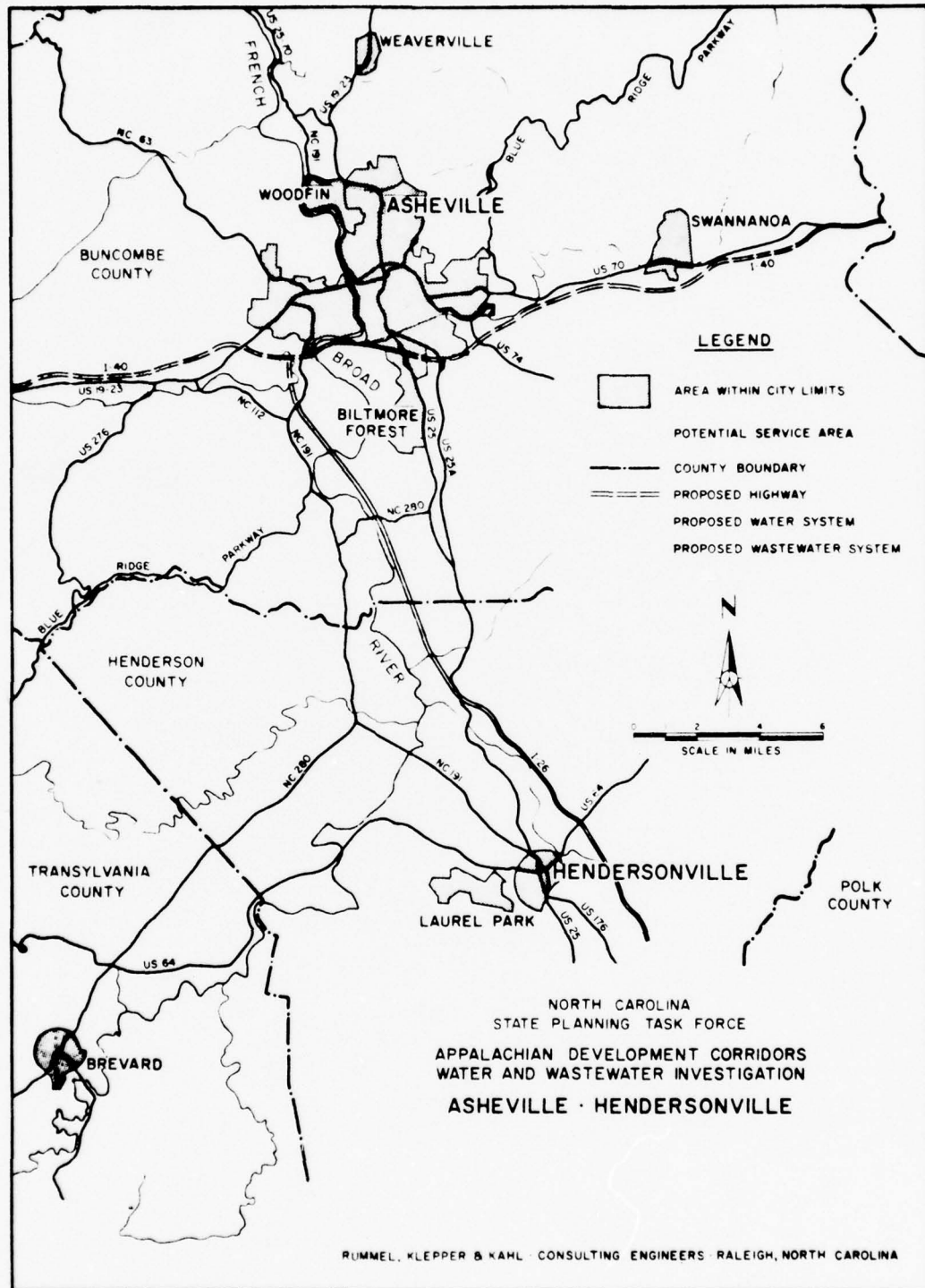
System Costs² (Design Year 2015)

<u>Item</u>	<u>Water³</u>	<u>Waste⁴</u>
Estimated Project Cost ⁵		
Maximum Statutory Grant		
Net Local Project Cost		
Bond Issue		
Annual Cost of Bond Issue		
Annual Operating & Maintenance Cost ⁶		
Total Annual Cost		

(Table will be completed at a later date)

- ¹ Same as design year 2015.
- ² Valuation & Cost Estimates are based on 1967 price levels.
- ³ Water system is defined as raw and treated water storage facilities, treatment facilities, and major transmission mains.
- ⁴ Waste system is defined as major interceptors, major pumping stations, and treatment facilities.
- ⁵ Project cost includes cost of construction, engineering and contingencies.
- ⁶ Operating and maintenance costs are averaged over the 50-year design period.

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PRELIMINARY

Figure 9

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III. POSITION PAPERS FROM STATE AGENCIES
AND REGIONAL ORGANIZATIONS

The Development of Water Resources and the Control of
Air Pollution in Appalachian North Carolina

George E. Pickett, Director
Department of Water & Air Resources

When the Appalachian Redevelopment Act of 1965 was under consideration, several aspects of life in the Region drew unusual attention as affecting the economic health of the area, and measures for improving the potential development necessary concentrated on them. Water resources is one of the keys. As a consequence, the Act as passed included a section directing the U.S. Army Corps of Engineers to make a "comprehensive plan for the development and efficient utilization of the water and related resources of the Appalachian Region." The plan was to be prepared in cooperation with other Federal agencies, as well as the States concerned.

An interesting guideline was provided which has been crucial in the planning process. It introduced opportunities to show more clearly the true benefits of water resource projects in relation to costs and better comparisons of alternatives, while vastly complicating the analytical planning processes. This guideline specifies a plan "giving special attention to the need for an increase in the production of economic goods and services within the Region as a means of expanding economic opportunities and thus enhancing the welfare of its people, which plan shall constitute an integral and harmonious component of the regional economic development program authorized by this Act."

An unusual feature of the Appalachian Water Resources Study was the extent to which Federal and state agencies worked in partnership on an equal basis. The only discouraging aspect of this partnership was the fact that not all states or state agencies could rise to the occasion and play a truly equal role, owing to insufficient trained staffs and background data pertinent to state interests. The effects of Title III of the Water Resources Planning Act in providing water resources planning grants was helpful but the benefits of this program came too late to be fully effective.

The Chairman of the Water Resources Board, General James R. Townsend of Durham, became the first North Carolina representative on the Federal-State Water Development Coordinating Committee. He expressed certain viewpoints in the first Committee meeting held here in Asheville in September 1965. Since that time, these viewpoints have been given weight in all activity of this Department. Slide 1 outlines several of these points.

1. The development of the water resources of the Upper French Broad valley to the fullest extent is a high priority.
2. Water supply and waste disposal facilities must be thoroughly analyzed and provision made for promotional excess capacities in suitable locations.
3. Feasible industrial sites must be identified or created and provided with the amenities to attract industry.
4. The Upper Yadkin River must be developed with an eye to the needs of the Piedmont as well as Appalachia.
5. Economic development must not sacrifice scenic and recreation resources.

A more detailed analysis of needs, together with the basis for an emerging North Carolina Water Plan, is included in a State Supplement to the Federal Report. This Supplement will be available in the near future.

Let me say something about management of water resources using the broadest recognized understanding of the word "management," and emphasizing State governmental roles. Water problems and water development opportunities involve:

1. Water rights and water control legislation
2. Control, management, or planning activities that should be assumed by State government
3. Water project construction

North Carolina is a riparian rights state, and this fact is primary in developing legislation and procedures to solve water problems created when the demand threatens to exceed the supply. Last year the General Assembly enacted seven laws affecting water resources that should strengthen the State's ability to solve certain forms of water resource problems. Unquestionably, in the future, these laws may have to be modified to fit developing circumstances, but further legislation does not seem indicated in the immediate future unless judicial and administrative experience should bring to the fore some technical weakness. The major water laws have now been published in a ready-reference volume for those with a need for a handy reference.

Water resources planning, control, and development and functions in which the Federal, state and local governments, and private enterprise all play prominent parts. The Board of Water and Air Resources is the primary State water agency, but it is inconceivable that the Board could 'go it alone' - only in concert with other State agencies and within the umbrella of the State planning system is real progress possible. Hence,

the Board carries out its statutory functions in cooperation with the State Planning Task Force and other State agencies, all under the guiding direction of the Governor. There are eight State agencies, which, in my judgment, carry the responsibilities for most matters relating to water resources. These are:

1. Department of Administration
 - State Planning Officer
 - State Property Officer
 - Emergency Planning Division
2. Board of Water and Air Resources
3. Board of Conservation and Development
 - Department of C & D
 - Division of Commerce and Industry
 - Division of Commercial and Sports Fisheries
 - Division of State Parks
 - Division of Community Planning
 - Division of Forestry
 - Division of Mineral Resources
4. Board of Health
 - Sanitary Engineering Division
5. Wildlife Resources Commission
6. State Soil and Water Conservation Committee
7. State Ports Authority
8. Recreation Commission

You will notice that I excluded the Institute of Government and the Water Resources Research Institute, because these are not operating agencies. There are so many others who have strong interests, generally lesser than the eight listed that I have prepared quite a comprehensive chart in an effort to show the relationships as well as to bring them into perspective with the Federal, local and private sectors. I won't discuss this chart, but it is attached to the published version of this paper (Table S-1).

What are the proper State agency functions in water resource management? I am going to list eleven which are generally accepted or beginning to be. These are for your thoughtful consideration and each would warrant discussion if the time permitted:

(NOTE: The comments are not to be used in the speech, but will remain in the printed text.)

1. Resolution, adjudication, and management of water rights problems.

Comment: This has been generally recognized as a State responsibility and Federal agencies have usually avoided interference. State administration of water rights is subject to higher law governing Federal rights.

2. Collection, analysis, and distribution of basic water resources data and fundamental information preliminary to plan preparation.

Comment: This has been a cooperative undertaking to a great degree with State agencies and Federal agencies pooling resources. In respect to the major programs of the U.S. Geological Survey, the cooperation has generally been through State financial contribution. In the area of ground water investigation, the State also has its own staff and conducts field studies. The necessity for the State to have its own ground water organization is based on the need to protect the resource, and to manage it as uses become more competitive, both functions being essentially State responsibilities which should not be given away. The tabulations of water uses and needs is primarily a State responsibility.

3. Regulation of waste discharges from community, industrial, and agricultural sources as required to maintain established water quality standards.

Comment: This has been recognized as fundamentally a State responsibility with Federal interest being limited to inter-state waters. These waters have been defined in North Carolina.

At present, State supervision is unquestioned provided State standards for interstate waters and the plan of implementation are acceptable to the Secretary of the Interior. The establishment of stream standards is a statutory responsibility. The control of waste discharge is largely regulatory in keeping with the established standards. Control of this function must remain as largely as possible in State hands, since major choices for economic development depend upon decisions related to water quality.

4. Regulation of water and hydro-power utilities.

Comment: This is an accepted State responsibility, although Federal dominance is recognized in matters defined as interstate commerce, or having to do with navigable waters.

5. Safety Regulation of Dams

Comment: The State has recognized and accepted this responsibility, although numerous exemptions are included in the legislation passed.

6. Non-structural flood plain management program.

Comment: This is a responsibility which the State has thus far not chosen to assume in a comprehensive or aggressive manner. However, it is a general consensus among water resource authorities that it is clearly a State government responsibility. The Federal government has chosen thus far to provide advice and planning assistance only. However, an Executive Order does require the release of Federal grants and loans for certain purposes to be contingent upon a satisfactory certification that projects are not so located as to contribute to future flood losses.

7. Provision of industrial and municipal water supply and the control of water quality for human consumption.

Comment: This has largely been a local and private responsibility, with the State exercising regulatory controls to protect health and the Federal government specifying health standards for water used in interstate commerce. A State government responsibility which is now beginning to be assumed is the determination of long term raw water needs, the furnishing of assurances for water supply storage in Federal reservoirs, and the allocation of these supplies to communities.

8. Formulation of water resource development plans.

Comment: This is clearly recognized as both a State and a Federal responsibility. A report prepared by a State will generally be oriented to that State's concept of its future needs. A report prepared by the Federal government may recognize some, but perhaps not all, of the State's needs as envisioned by State interests, and certainly will be oriented to national interests. In North Carolina, actual plan formulation has, in the past, been left exclusively to the Federal government. The only exception has to do with local or sub-regional project planning for water supply and waste treatment systems. The State participation in Federal planning has been generally limited to (1) petitioning the Federal government to make a study and propose projects; (2) providing limited liaison during the study period; (3) commenting on or supporting the proposed Federal plan or both, (4) promotional activities toward Congressional financing of desired projects.

9. Initiating State construction projects, or grants and loans for that purpose.

Comment: The State program in this field is relatively minor, although the General Assembly has appropriated funds for public works, primarily for grants to supplement local shares of coastal protection projects. This is a precedent which suggests the possibility that State programs of this nature may expand in the future. In the last Department budget request, funds were requested for coastal projects and for small channel and watershed projects; for a small dredge; and for grant funds for waste treatment projects to supplement the Federal program. The last two items failed, but the trend toward more involvement in future construction is discernible.

10. Supporting and sponsoring water resources research oriented to State needs.

Comment: This is a normal State function if it is to protect its own interests and guide its own destinies. The North Carolina Water Resources Research Institute is the center for research. The Institute of Government, in association with the Research Institute, concentrates on research in the fields of law, management, and policy. The Department of Water and Air Resources maintains a continuing liaison with the Research Institutes and provides guidance on research needs and priorities as seen in terms of its mission.

11. Preservation and protection of wildlife, conservation of natural resources, promotion of recreational facilities, and preservation and enhancement of aesthetic assets, as related to water.

Comment: The areas of interest defined do not constitute an exclusive State responsibility, but describe activities of the utmost importance to State interests, justifying a high level of financial support and staff attention.

The eleven functions do not necessarily describe all State responsibilities, and it is not intended to suggest that the various State responsibilities are exclusively, or even primarily, tasks assignable to the Board of Water and Air Resources. Casual reflection will suffice to identify major roles for the other seven major water-related agencies.

Three other topics that must be considered at all times in connection with water resources are: (1) water quality; (2) the appropriate use of ground water; and (3) the enhancement where possible and the preservation of maximum aesthetic, fish and wildlife, and recreational assets.

The State of North Carolina has a water pollution control law and a stream classification system that are second to none in terms of progress being made, feasibility, consistency with the technical state of the art, economics, and the expressed desire of the citizens affected. This does not mean that unanimous opinion exists on this subject, but the Board is perfectly willing to stand on its record and to provide the facts in regard to any feature of this highly complex and misunderstood subject. I wish to stress that the responsibility for clean streams is not limited to the Board of Water and Air Resources. The Board of Health also has its responsibility for protecting waters used for public water supply and for the discharge of wastes from State institutions, the Federal government is responsible for waste control at its numerous large and small installations. Finally, and not necessarily least, there is the responsibility of individual citizens, so many of whom contribute to the problem, with little chance of being held to account, by disposing of trash, garbage, bottles, cans and old tires in the streams. The North Carolina Standards for Interstate Waters have

been approved by the Secretary of the Interior, who was highly complimentary, despite some exceptions which are to be negotiated. These exceptions entail major policy issues which affect State sovereignty, among other things.

Ground water is one of North Carolina's great mineral resources, even in Appalachia. It is replenished by rainfall and constitutes the base flow of the stream systems. Surface reservoirs can rarely store all the excess runoff of a single year, but the ground water reservoir holds up to 29 years of normal rainfall supply. Its character and availability are not well understood by the average citizen, or even by some engineers. For this and for other reasons, it often happens that a water supply investigation made to fill community or industrial needs will pass over the availability and economics of ground water supply rather cursorily. The Department of Water and Air Resources strongly recommends that a systematic and complete analysis always be made to determine the desirability of ground water versus surface water including consideration of conjunctive use.

I will not mention aesthetics, recreation, fish and wildlife, because of the presence of other speakers far better qualified to speak on these subjects than I. I do wish to emphasize that we in Water and Air Resources are part of the State team seeking common and acceptable solutions wherever problems arise.

The water resources development measures needed to promote the overall economic development of Appalachia require local, State, and Federal action separately and jointly. The necessary planning is a long way from complete. The major projects required or to be required are largely as classified on Slide 4.

1. Multiple and single purpose dams and systems of such dams with channel improvements, levees, and other facilities on main rivers.
2. Similar systems coupled with land treatment measures on upstream watersheds (under 250,000 acres).
3. New and expanded water supply and distribution systems.
4. New and expanded waste collection and treatment systems.

Coupled with these projects, it is necessary to plan for and provide recreation, boating facilities, access, service facilities, and other construction.

Also required are management institutions, land-use plans, zoning, flood management, and the development of suitable support for industrial development.

The Department has analyzed needs and reached some conclusions. However, much data collection and study are still required. An attempt

was made to forecast needs of each of the seven local development districts and then to convert these needs plus other general State and interstate needs into requirements that could be applied to river basin areas, since the river basins are the most suitable study units for water planning. The more optimistic population growth projections prepared by the Office of Appalachian Studies were utilized. These postulate a 300 percent growth by the year 2020.

The water-use projections were as follows:

GENERAL PROJECTIONS OF WATER USE TO THE YEAR 2020

<u>Use</u>	<u>Total Annual Use in Acre Feet</u>	<u>Same Use Converted to Million Gallons Per Day</u>
Urban with Connected Industry - up to	275,000	245.5
Self-Supplied Industry up to	456,000	407.1
Rural Domestic	50,000	44.6
Stock Watering	12,000	10.7
Irrigation - up to	<u>180,000</u>	<u>160.7</u>
	973,000	868.6

NOTE: Omite hydro, major cooling, institutional, Federal and some other miscellaneous uses.

The total projection, which is an average use rather than a peak use, is more than fifty times greater than the maximum daily use at Raleigh during the 1967 peak summertime period. The projected use is about three times the current State-wide equivalent use.

There are thirteen river basins or portions of river basins in Appalachia. While we think of economic development in terms of local development districts, we usually plan comprehensive water resources development in terms of river basins. The outline map of Appalachia shows the relationship between basins and districts.

The following tabulation summarizes the large and small multiple-purpose type developments that are now under consideration or under construction:

<u>Major Systems or Single Impoundments</u>	<u>Definitely Supported by the State of N. C.</u>	<u>Currently Being Considered by the State of N. C.</u>
Broad River Basin		\$35,700,000
French Broad River Basin	\$ 96,000,000	
New River Basin	73,800,000	
Savannah River Basin	Minor	
Yadkin - Pee Dee River Basin	7,470,000	33,977,500
<u>Small Watershed Program</u>		
Broad River Basin		1,168,300
Catawba River Basin	1,376,500	
Little Tennessee River Basin	Minor	3,385,000
Roanoke River Basin	2,350,000	
Yadkin - Pee Dee River Basin	<u>8,245,000</u>	<u>6,966,900</u>
	\$189,231,500	\$81,217,700
	\$270,449,200	

Some details of the major systems and small watershed programs are shown on Slides 8 (Upper French Broad), 9 (Broad-Clinchfield), 10 (Upper Yadkin), 11 (Reddies), 12 (Roaring), 13 (Mitchell), 14 (Fisher), and 15 (P.L. 566).

The two other elements of a comprehensive water resources development program are not so readily tabulated, but it is possible to estimate the progress being made. There are at least 70 community water systems in Appalachia. Many of these are outdated or loaded to capacity. The ultimate program should include provisions for modern facilities and at least some excess capacity in all systems. Using a grant from the Appalachian Regional Commission, the State Planning Officer has retained the consulting firm, Rummel, Klepper, and Kahl, to examine selected growth areas along Interstate and Appalachian corridor highways. The study is intended to establish the need, feasibility, cost and financing of expanded water and sewerage systems for the specific purpose of encouraging economic growth. It is too early to specify the findings, but already the firm has identified at least \$31,000,000 in desirable water plant construction.

The last of the four major groups of construction projects is the provision of waste collection and treatment systems. There are 60 communities in the Region which now provide sewer services:

Cost or Estimated Cost

28 have provided satisfactory facilities	\$20,800,000
21 have under construction or are preparing to construct the needed facilities	9,900,000
9 of the remaining 11 are making satisfactory progress, while two are having financial troubles, the estimated cost is	11,400,000
117 other unsewered communities with populations of 200 or more, with some possible exceptions need facilities estimated at	<u>31,900,000</u>
Total Program	\$74,000,000
Remaining for consideration of definite action	\$43,400,000

Rummel, Klepper and Kahl have identified \$22,000,000 of waste facility construction, which is probably additional to the figures shown. Thus, there is a total of almost \$400,000,000 in water projects probably required with only a small portion completed or under construction. Obviously, there is a large task ahead for all concerned.

It is not practicable to estimate in dollars the backlog of industrial waste treatment facilities needed. Currently, 81 industries have significant waste discharges to streams. Of these, 64 are providing adequate treatment while 17 have yet to do so. Very commendable progress has been made in pollution abatement and the anticipated goal is that all necessary waste treatment measures will be constructed by 1972 where direct discharges are now being made to the area streams.

Turning now to the Air Pollution Control Program, legislation passed by the General Assembly in 1967 added this responsibility to the existing water pollution control organization and created the Board of Water and Air Resources.

Five tasks were assigned, as shown on Slide 17.

1. Conduct studies to define existing air quality and to identify problem areas.

2. Develop air quality and emission control standards.

3. Develop and adopt pollution abatement plans.
4. Develop and adopt classifications for air contaminant sources.
5. Provide general supervision of local air pollution control programs.

A staff of nine persons has been assembled and a considerable amount of technical equipment purchased. An Air Control Advisory Council has been appointed.

North Carolina recognizes that the abatement of air pollution, being in the public interest, costs money from which the owner cannot make a return on his investment. Accordingly, the Revenue Act of the State provides certain tax benefits to persons constructing air pollution abatement facilities (and to water pollution abatement facilities as well) in accordance with approval documents issued by the Board.

The State's air pollution control program applies equally to all regions; however, there are local programs that have specific effects in the Appalachian Region. Among such programs is the one administered through the Buncombe County Health Department that involves Buncombe, Henderson, and Haywood Counties. There is also a new program presently being organized to serve Forsyth, Surry, and Davie Counties. The Buncombe, Henderson, and Haywood program organization has adopted rules and regulations to control open burning and the emission of dark smoke. Air quality standards have not yet been adopted. These programs, when certified by the Board, will include authority to specify rules, regulations, air quality standards, and to carry out pollution abatement activities in the respective areas of jurisdiction. Additional programs are needed in the Region to assist in administering a comprehensive State-wide air quality control program.

Fortunately, North Carolina does not now have an air pollution problem of the magnitude of that existing in many of the large metropolitan areas of the Nation. It is the primary objective of the State's efforts to preserve the quality of the atmosphere and thereby enhance the quality of living in North Carolina.

* * * * *

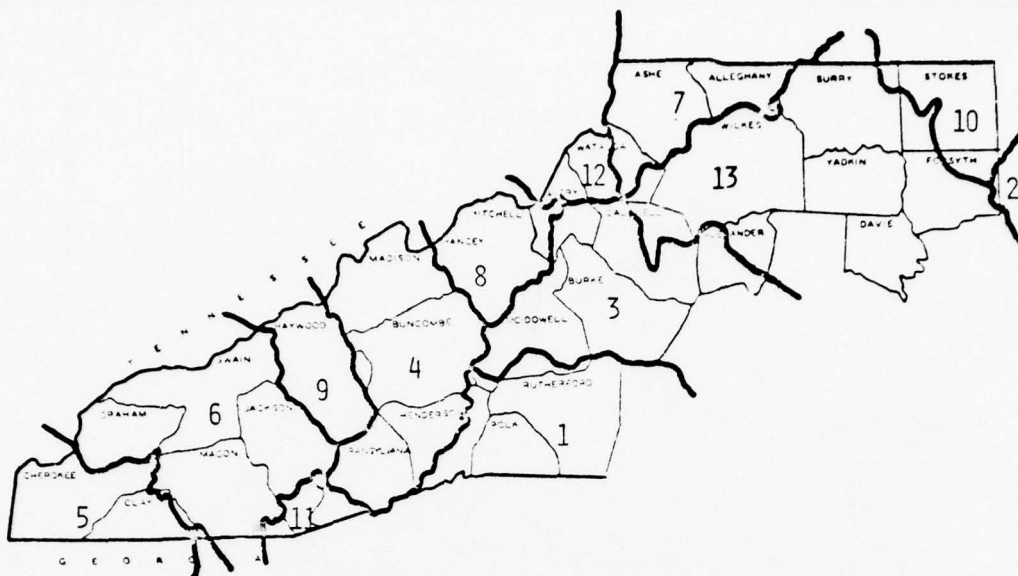
Slides 1, 2, 3, 4, 5, 7, 16, and 17 are in the text.

Reproduction of slides 6, 8, 9, 10, 11, 12, 13, 14, and 15 follow.

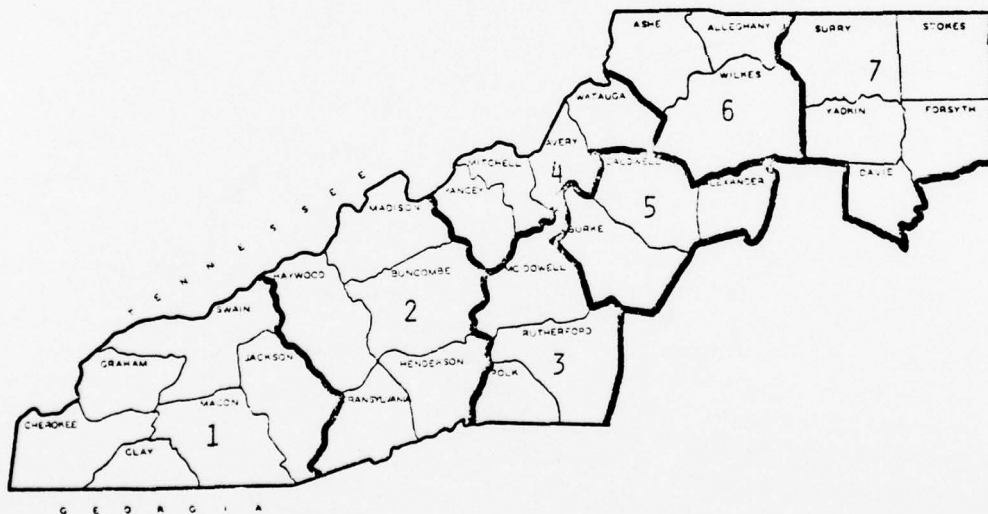
After the slide 15 reproduction is attached, Table S - 1 referred to on page 4 of the text.

V-127-NC

The book, Laws of North Carolina Relating to Water and Air Resources is available from the Michie Company, Charlottesville, Virginia. A limited number of copies for official use are obtainable from the Department of Water and Air Resources.

RIVER BASINS

- | | |
|---------------------|----------------------|
| 1. Broad | 8. Nolichucky |
| 2. Cape Fear | 9. Pigeon |
| 3. Catawba | 10. Roanoke |
| 4. French Broad | 11. Savannah |
| 5. Hiwassee | 12. Watauga |
| 6. Little Tennessee | 13. Yadkin - Pee Dee |
| 7. New (Kanawha) | |

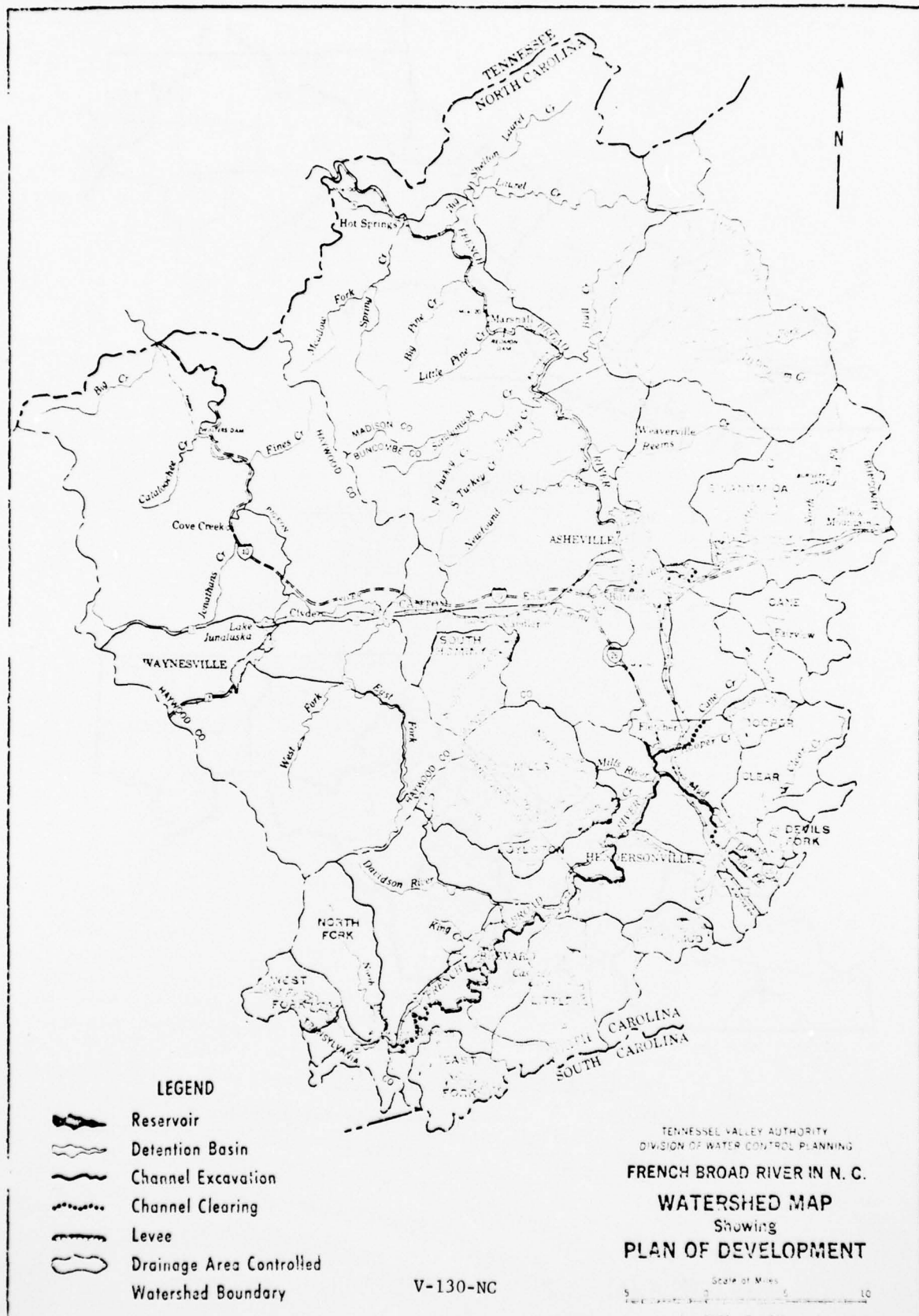


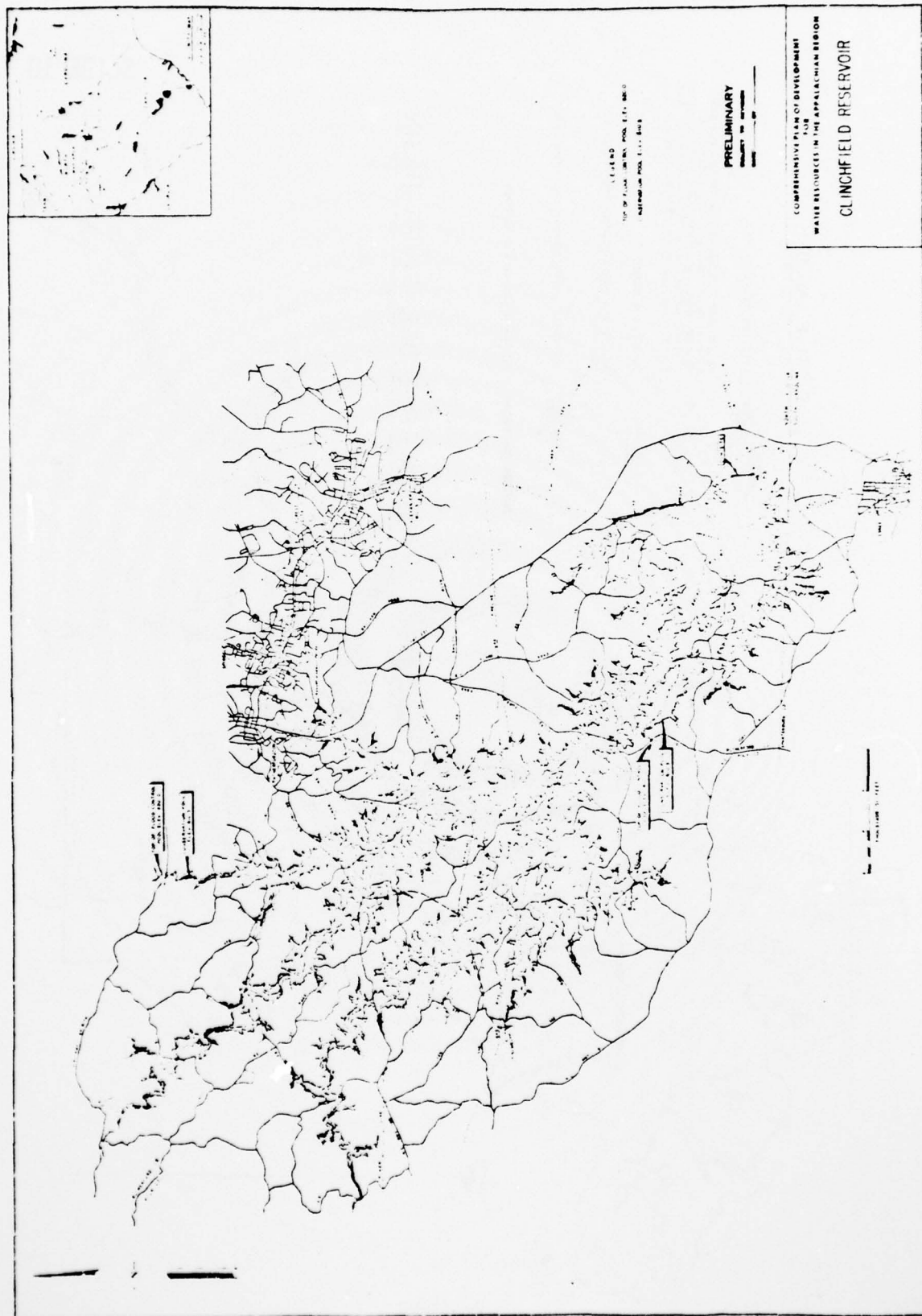
LOCAL DEVELOPMENT DISTRICTS

- | | |
|-----------------------|-----------------------------|
| 1. Southwestern | 5. Alexander-Burke-Caldwell |
| 2. Upper French Broad | 6. Blue Ridge |
| 3. Isothermal | 7. Northwest |
| 4. Mountain Scenic | |

LOCAL DEVELOPMENT DISTRICTS AND RIVER BASINS IN APPALACHIA

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LEGEND

EXISTING RESERVOIRS

RESERVOIRS CONSIDERED IN HOUSE DOCUMENT NO. 652, 74TH CONGRESS, 2ND SESSION, APPROVED 1944, UNDER RESOLUTION BY THE COMMITTEE ON PUBLIC WORKS OF THE U.S. SENATE, ADOPTED 26 JUNE 1962

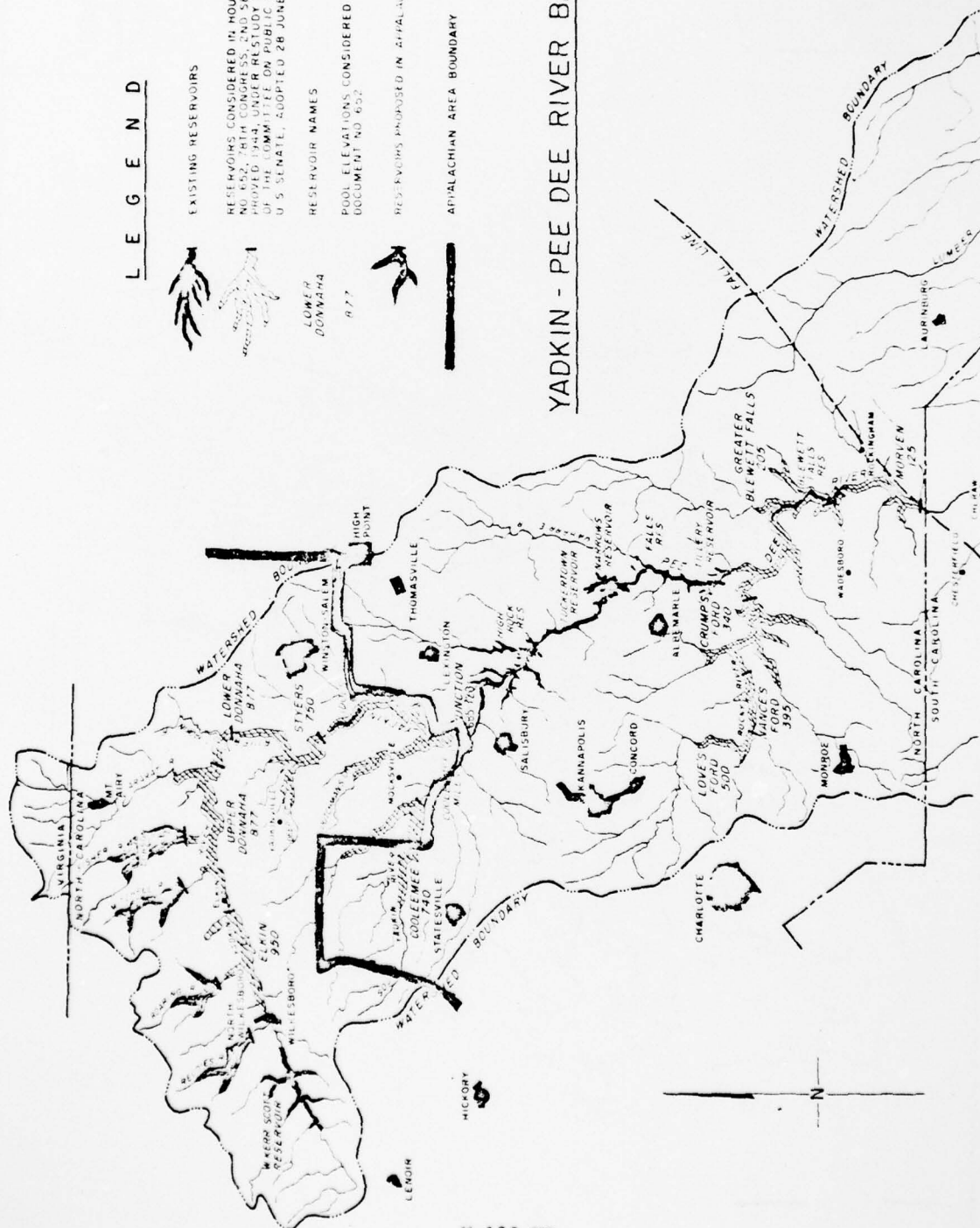
RESERVOIR NAMES

POOL ELEVATIONS CONSIDERED IN HOUSE DOCUMENT NO. 652

RESERVOIRS PROPOSED IN APPALACHIAN STUDY

APPALACHIAN AREA BOUNDARY

YADKIN - PEE DEE RIVER BASIN



AD-A041 397

CORPS OF ENGINEERS CINCINNATI OHIO
DEVELOPMENT OF WATER RESOURCES IN APPALACHIA. MAIN REPORT. PART--ETC(U)
APR 69

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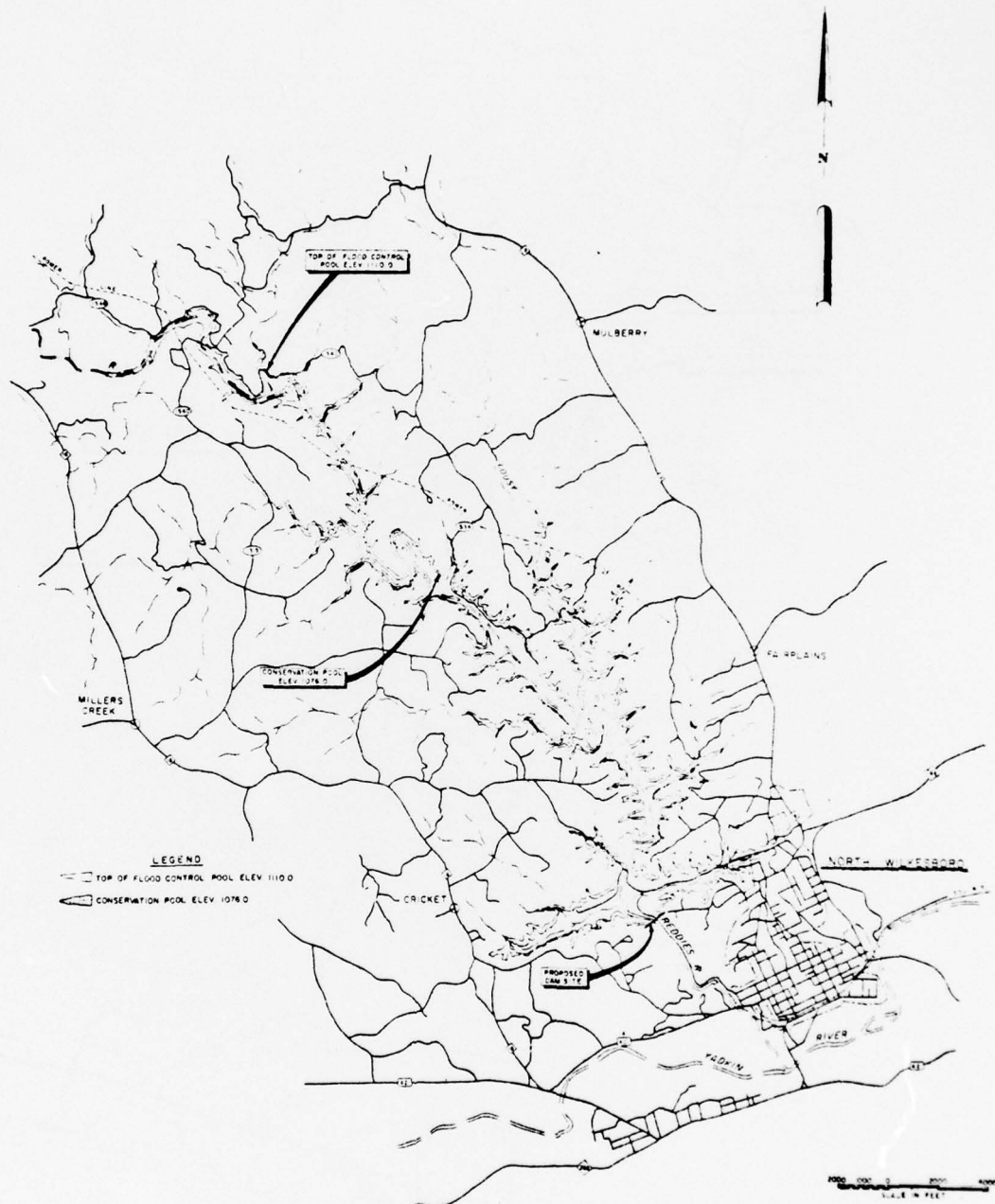
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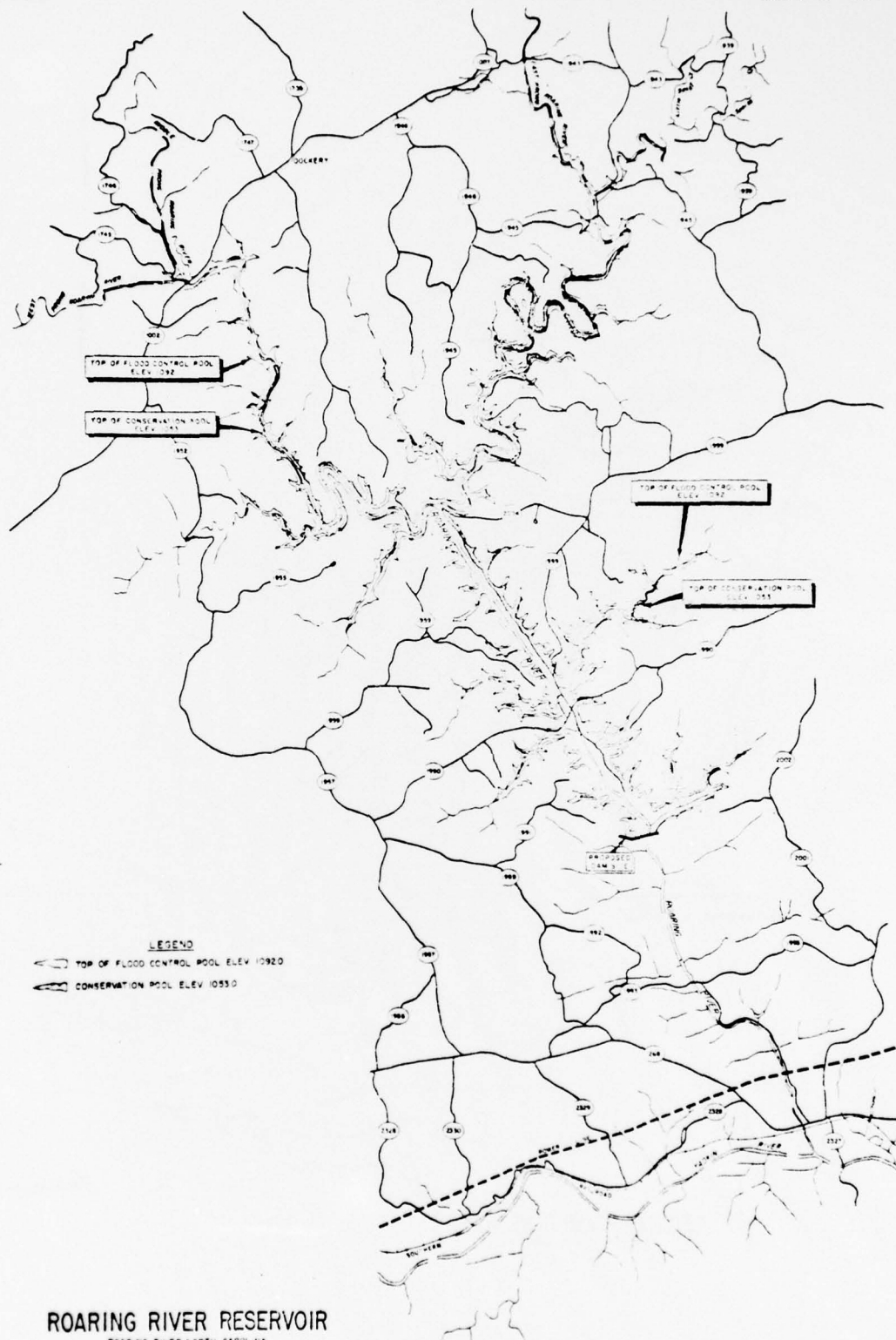


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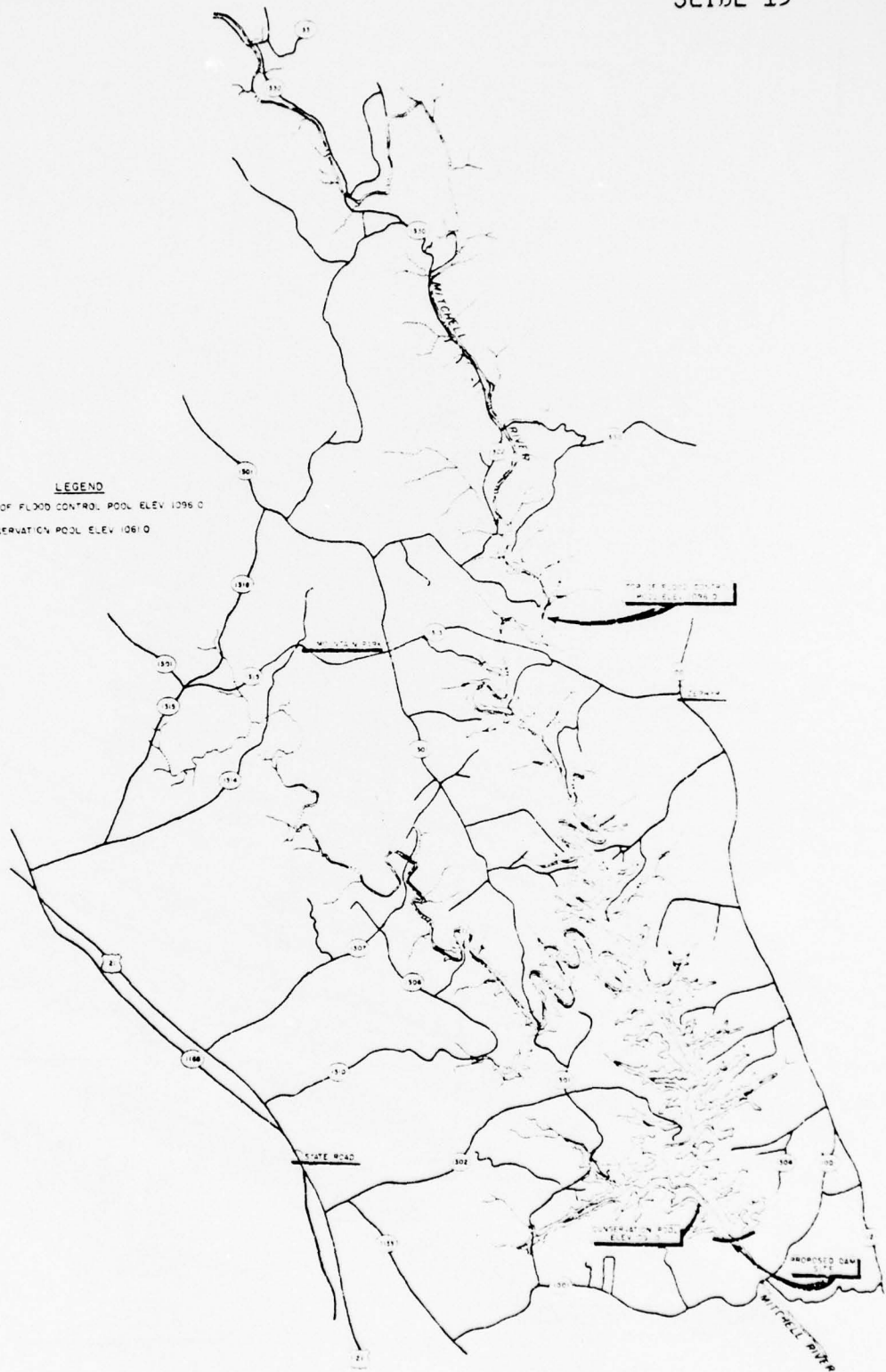
REDDIES RIVER RESERVOIR
REDDIES RIVER, NORTH CAROLINA



ROARING RIVER RESERVOIR
ROARING RIVER, NORTH CAROLINA

V-134-NC

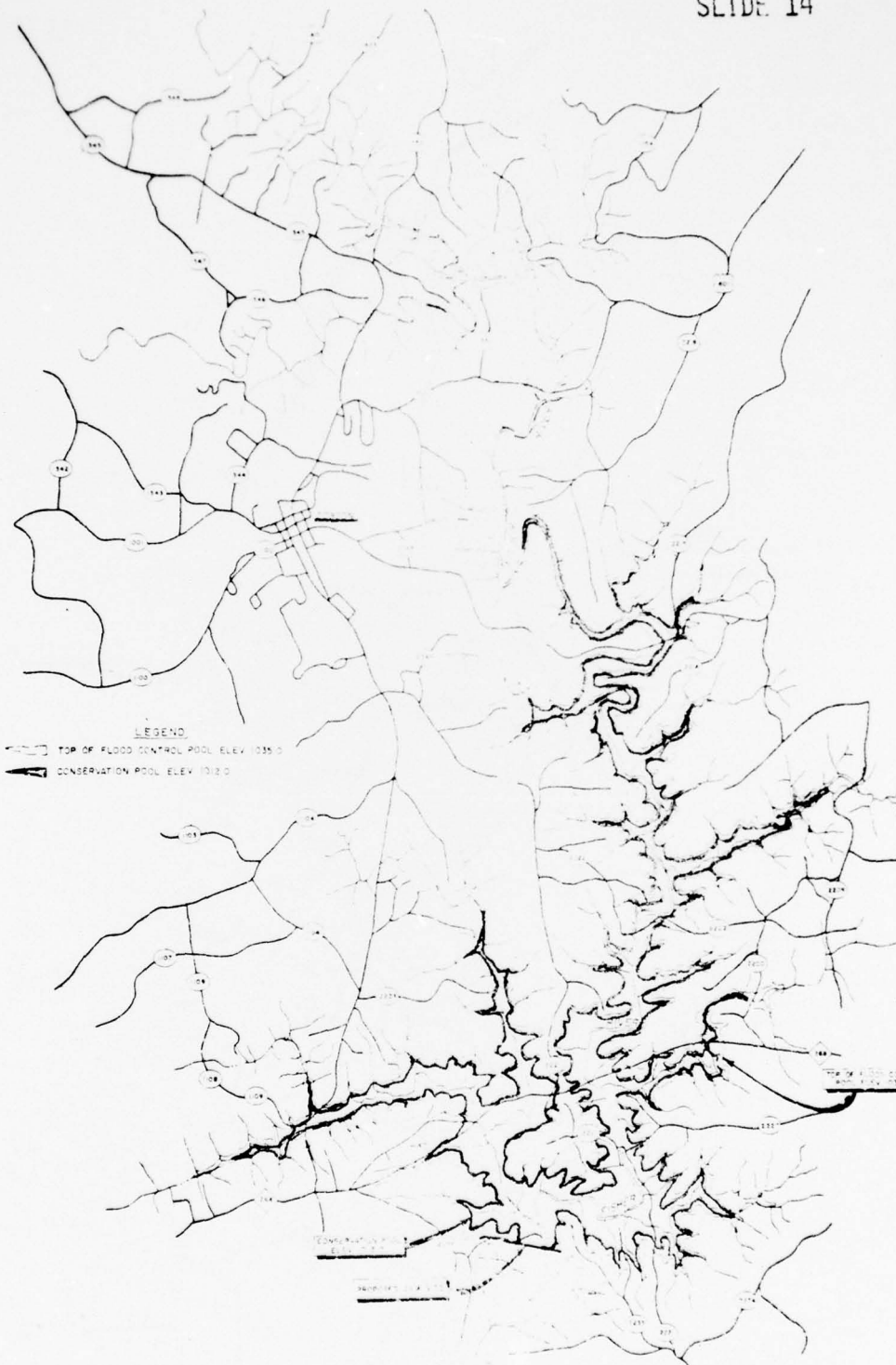
LEGEND
 [Symbol] TOP OF FLOOD CONTROL POOL ELEV 1096.0
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MITCHELL RIVER RESERVOIR
 MITCHELL RIVER, NORTH CAROLINA

V-135-NC

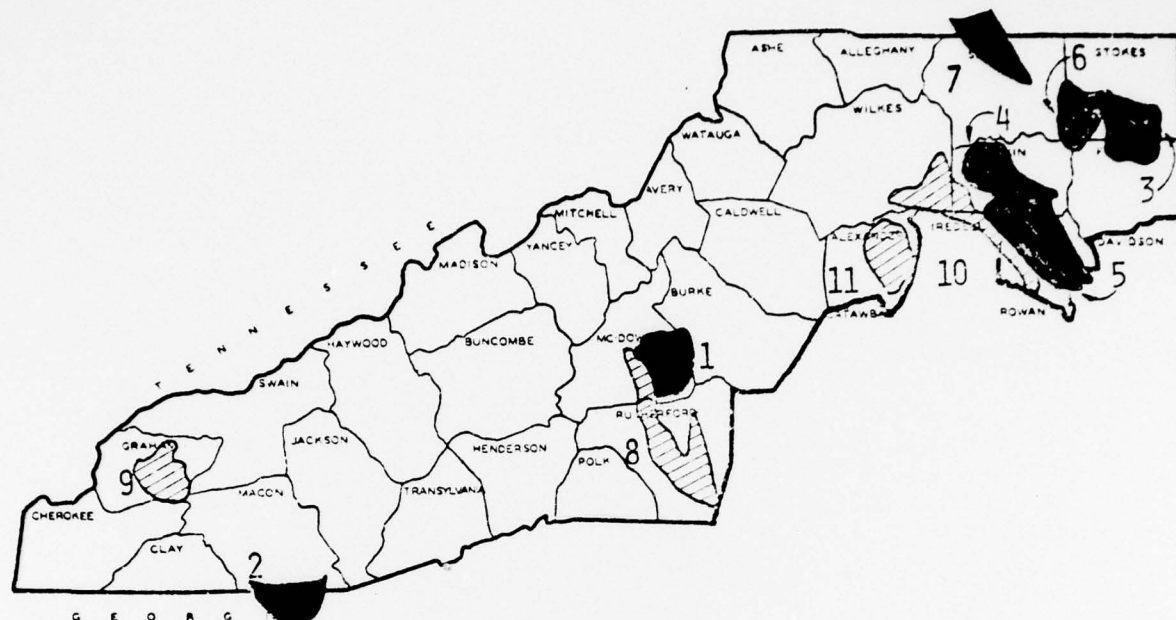




FISHER RIVER RESERVOIR
FISHER RIVER, NORTH CAROLINA

V-136-NC





PUBLIC LAW 566 PROJECTS IN APPALACHIA

Solid - Approved by Board of Water & Air Resources

Hatched - Studied as part of Appalachia Water Resources Survey

NOTE: Other P. L. 566 projects omitted

APPROVED	PROPOSED
1 MUDDY CREEK	8 SECOND BROAD RIVER
2 HEAD OF LITTLE TENNESSEE	9 TALLULAH CREEK
3 TOWN FORK CREEK	10 HUNTING-BEAR CREEK
4 DEEP CREEK	11 UPPER SOUTH YADKIN
5 DUTCHMAN CREEK	
6 LITTLE YADKIN RIVER	
7 STEWARTS CREEK-LOVILLS CREEK	

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Conservation

By: Clyde P. Patton, Executive Director
North Carolina Wildlife Resources Commission

It is indeed an honor and a privilege for me to be called upon to speak to this distinguished gathering in behalf of natural resources conservation.

While my specialty has been in wildlife resources, I and my associates have long realized that wildlife resources are a beneficiary of practices that serve to benefit other renewable natural resources - soils, forests, and waters.

What is conservation? Perhaps the simplest definition is "wise use". In our highly complex society, conservation may be defined as the manipulation of total environment to the end that mankind and the resources upon which it depends may exist in perpetuity.

We have made tremendous progress in the field of natural resources conservation. We have learned to manage our forests so that they produce a sustained yield of lumber, pulp, and a variety of other forest products. Forests provide habitat for fish and game, not to mention recreational opportunities such as hiking, camping, fishing, hunting, and bird watching.

While we still depend largely on rainfall for our water supply, we have learned - too often the hard way - that we must keep our waters clear and clean so they can be used over and over again.

We have learned to keep our soil where it belongs - on the hillsides and on the fields where it can produce food and fiber for human use. We have learned to manage our fish and game so that a new crop is produced each year to supply an ever-increasing demand by hunters and fishermen for this type of outdoor recreation.

As our human population grows, as municipal, industrial, transportation, and communication facilities expand, we must increase our efforts to renew and even improve our renewable natural resources. We must stay on top of the situation, so to speak, or we will go under. There is no alternative.

I could spend the next two hours decrying the impact the Appalachian Development Program will have on the wildlife resources of western North Carolina. I could tell you that most of the fish and game resources in this section of North Carolina can be written off as another sacrifice to progress. Such a statement would not be true. But to say that this program will not create wildlife conservation problems would be equally untrue.

Rather, I will take these few allotted minutes to outline ways and means and plans whereby the Wildlife Resources Commission can fulfill its obligation to the sportsmen and nature lovers of North Carolina and their visiting friends from other states, and do this without putting roadblocks in the way of the Appalachian highway development program.

According to the Book of Genesis, Man was given dominion over the earth and the sea and the sky. We now have dominion over these, and even the fringes of space - a concept not anticipated by the writer of the Book of Genesis. But no directions and no formulas were given in Genesis to instruct Man on how to maintain his dominion without destroying his environment, and ultimately himself.

Have we yet to learn that, unless we perpetuate our natural environment in something like its original condition, we cannot perpetuate ourselves? Few, if any, people concerned with the propositions being discussed here would say "No! This program should not be carried on! This will destroy our natural beauty, our natural resources. We cannot have our cake and eat it too!"

It is my contention that we can have our cake, we can eat it, and bake even better, more nourishing cakes in the future! I believe that we can preserve most of our natural beauty and utilize our renewable natural resources by proper forethought and planning. What good is natural beauty if only a few people can see it? What good are natural resources if we cannot use them?

Today, mountain trout fishing is one of the major attractions of western North Carolina. It draws thousands of people to this area each year and bolsters the economy of this region by hundreds of thousands of dollars. The construction of interstate highways and corridors and access roads will make our mountain trout fishing accessible to at least ten times the number of people who are enjoying it today. Will this tremendous influx of people result in the ruination of our trout fishing? It need not be, and it shall not be.

To my mind, it is doubtful that stream destruction through excavation, grading, filling, erosion, siltation, or stream bank vegetation denudation will be of major significance or have lasting results.

For the past several years Federal and state trout hatcheries have been stocking about 650,000 creel-size trout in North Carolina's 2,000 miles of trout streams each year to satisfy current trout fishing demand. If this demand increases tenfold, trout production can be increased tenfold. But someone - logically the trout fisherman through his license money - is going to have to bear the cost. This is what we call put-and-take trout fishing, and it has been going on for many years in most of our trout waters. It has been proven to be successful and there is no reason to believe it cannot be increasingly and continually successful, as necessity requires and as funds are made available by those who

benefit. There is no way to add to the number or length of natural trout fishing streams already in existence. We can only strive to preserve and improve those we already have, and curtail, as far as is practical and reasonable, encroachment upon them.

There is a practical, economic and even profitable way to alleviate fishing pressure on our natural trout streams. Ten years ago, western North Carolina had only two or three licensed commercial trout fishing pools where a tourist could stop along the wayside, and for a fee paid to the pond owner, catch genuine North Carolina mountain trout, have them dressed and frozen, and take them back home to Cleveland, Cincinnati or Memphis, Chicago or Detroit or New York, where he could serve them to his friends with the honest boast, "I caught these fish in the classic reaches of North Carolina's incomparable mountains."

On June 1 of this year, there were 37 of these put-and-take trout fishing pools in operation, and more are planned. As far as can be learned, both the businessman operators and their tourist customers seem to be completely happy with the entire arrangement.

Some may say this is commercialization of a natural resource. But commercial exploitation of a renewable natural resource cannot be criticized as wasteful as long as the resource involved is regularly replaced, perpetuated and even expanded.

Commercial trout ponds are especially attractive to the novice trout fishermen; at the same time, they serve to keep the would-be Waltonian from trampling the shores and shallows of natural trout streams, scaring the fish and spoiling the fishing for us experts.

What about game? Deer, bear, European wild boar? Ruffed grouse? How will interstate highways, corridor roads, and access roads affect these?

It would be easy to say, "the impact of more people invading our now-remote mountain game habitat will have a devastating effect on our supply of game." I doubt if this would be a realistic statement.

Every mile of superhighway, as planned in the Appalachian program, will mean the loss of many acres of prime wildlife habitat. More acres will be lost to municipal and industrial expansion. These are facts that we simply will have to face up to and make plans and adjustments to mitigate the damage. One has only to fly over the mountains of western North Carolina to realize the vastness of the area. It is true that long, narrow stretches of land will be covered with concrete and asphalt, but by comparison with the total area involved, this is not a substantial depletion of wildlife range. We can concentrate on further, more intense habitat development and improvement; we can improve the carrying capacity of the present range to offset the loss.

There is no question that hunting pressure, especially for big game, will increase tremendously. In the mountain region of North Carolina, most big game hunting and much small game hunting is done on public lands. Hunting pressure on these lands can be controlled by simply limiting the number of hunters permitted on these areas, and when necessary, limiting the length of the seasons and the size of the bag limits to produce an annual huntable surplus compatible with the carrying capacity of the land.

Wild animals, especially big game, are a tremendous attraction to tourists. We can visualize the establishment of deer parks, for example, developed by private enterprise or public agencies, where animals may be enclosed in an area of their natural habitat so that people can see them, photograph them, perhaps pet them and feed them. This, for obvious reasons, would not be recommended for bears.

The construction of interstate highways, corridors, and access roads will have at least one beneficial effect on wildlife. It will create what biologists call "the edge effect," a phenomenon related to food, cover and open area conditions, that cause game birds and mammals to be more abundant at the edge of woodlands than farther into the forest or out in the open spaces.

Meanwhile, these same roads will open vast areas of fish and game habitat that hitherto were extremely difficult of access. This may bring to many people the temptation to park along the roadside and slip out to poach a few trout or deer or ruffed grouse. This will require the training and employment of more law enforcement personnel and the purchase of necessary equipment. It may make advisable certain parking restrictions or the construction of barrier fences along the corridors, as well as the interstate highways, in certain places to keep people from illegally entering the woodlands or park areas and keep game mammals from crossing the highways where they might be killed or cause automobile accidents and property damage.

As to poaching of fish and game, the Wildlife Resources Commission has dealt with this problem for many years. We will need more well-trained, highly qualified personnel to enforce firmly, fairly and impartially, laws and regulations that are reasonable, understandable, and enforceable, to assure everyone an equitable share in the harvest. This will cost money; in this case, hunting and fishing license money. Let me hasten to add that there is no easy, inexpensive road to natural resources conservation.

All of us are aware that the Appalachian Development Program will create problems. We are equally aware that every agency concerned must face up to these problems. Working as individual agencies and collectively as groups of agencies, we can get the job done and even expect to improve the public service we are now providing. This program is much bigger than western North Carolina or Appalachia alone. It will have

its impact, through a growing human population and ever-improved systems of transportation and communication, on other regions of the State and on the entire nation.

We, of the Wildlife Resources Commission, believe we can solve our share of the problems under discussion at this Conference and contribute to making our environment and our great State a finer place in which to live.

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Wildlife Resources in Appalachia

The Role of North Carolina Wildlife
Resources Commission Programs in Appalachia

In Support of a Talk by Clyde P. Patton, Executive Director,
North Carolina Wildlife Resources Commission, at the Confer-
ence on Appalachian Development, Asheville Biltmore College,
Asheville, North Carolina, June 25-26, 1968

The North Carolina Wildlife Resources Commission was established by the enactment of the Wildlife Resources Law of 1947 (Article 24 of Chapter 143 of the General Statutes of North Carolina). This law provided for nine wildlife districts, three of which embrace all of the counties included in the Appalachian section of North Carolina. Each district is represented by the Commission, by a Commission member appointed by the Governor for a six-year term. These districts have a full complement of law enforcement and wildlife management personnel.

Districts are further subdivided for purposes of enforcement of the fish, game and boating safety laws and regulations; the size of these subdivisions being based on the number of people served, the fish and wildlife resources present, normal and unusual work loads anticipated, and general land and water characteristics of the areas concerned.

The Wildlife Resources Commission operates wildlife management areas throughout the State. Supervision of personnel working on these areas is done by appropriate regional supervisors. The regions concerned are eastern, central, northern and western. The emphasis here is on the western and northern regions.

Wildlife management areas were established and are managed for the production and harvest of big game - deer, bear, boar, and turkey. They also afford considerably small game hunting and in the case of Appalachia, they provide excellent fishing for mountain trout.

Wildlife management areas within the North Carolina bounds of Appalachia are: Daniel Boone, Fires Creek, Flat Top, Green River, Harmon Den, Mount Mitchell, Pisgah, Rich Laurel, Santeetlah, Sherwood, South Mountains, Standing Indian, Thurmond Chatham, and Wayah Bald.

These areas presently serve hunters from within a radius of 400 miles, and in many instances, far beyond. The capacity of these areas to handle many times the present number can be realized by the development of suitable game habitat, and the improvement and stocking of existing trout fishing waters and other waters where fishing for other species is available.

For a number of years the Wildlife Resources Commission has acquired and developed public fishing and boating access areas at a rate compatible to the availability of funds for this purpose. More of these areas will be needed in the presently planned-for future; but the terrain surrounding waters where such access facilities are needed makes them extremely expensive in comparison to those in the central and eastern sections of the state.

Fisheries Management

The North Carolina counties included in the Appalachian Development Program closely coincide with those counties of the State that have mountain trout fishing waters and which comprise the area of the State where the mountain trout fishery resource exists. The stated purpose of the Appalachian Regional Development Act of 1965 is to improve the economic welfare of the people in the Region. There is little doubt that tourism now represents one of the greatest potential assets of our mountain region. At least half of the Federal funds available to Appalachia in the Act will be allocated to the states for construction of highways in the Region. With this in mind, our proposal is to develop a public trout fishery of superior quality that will tend to keep visitors in the Region once these new highways make it possible for them to reach it. J. Harry Cornell, Chief, Division of Inland Fisheries, has made the following statement in this regard:

"It is practical to raise trout by the intensive method in any quantity desired so long as the program can be financed. North Carolina is unique in the southeastern states in its quantity of water suitable for trout fishing. Trout can be propagated and stocked in these waters in any quantity than can be financed. As evidenced by the success of the 'Cherokee Program,' large numbers of tourists will be attracted by and will remain to enjoy high-quality trout fishing. At present, the Wildlife Resources Commission is going as far as its finances will permit in providing a good trout management program. However, it can be improved indefinitely to the extent that additional funds are made available. This could be accomplished by the construction of additional trout hatcheries and employment of additional personnel to propagate the fish and to stock them in the waters which are open to public fishing.

"The use of a high-quality trout fishing concept as a means of implementing the Appalachian Program will require recognition of a secondary but correlated problem which, at present, is equally beyond the financial resources of the Wildlife Resources Commission. At the present time, there are approximately 2,000 miles of trout streams open to free public fishing.

Approximately one-half of this resource lies on lands which are in public ownership and where we can depend on permanent public access. The remaining thousand miles, or fifty percent of the resources, lie on lands which are in private ownership. These streams are open to public fishing at the sufferance of the landowner in exchange for stream stocking at public expense. Any closure of these private lands to public trespass at once removes these streams from consideration as a part of the public trout fishing resource.

"In addition to the two thousand miles of trout streams, there are over 3,500 acres of impounded waters included in our 'Designated Mountain Trout Water' program and which are stocked with trout for public fishing. By virtue of their limited volume, the streams constitute the most desirable waters for concentrated stocking and consequent superlative trout fishing. The trout lakes, with heavy stocking, will offer better-than-average trout fishing in addition to opportunities for associated water sports such as swimming, boating, and water skiing. Our existing opportunities for water-based recreation, with high-quality trout fishing added, should produce a tourist attraction of national renown and permanent benefit.

"If high-quality trout fishing is produced by means of a considerably expanded fish hatchery and habitat management program, it may be anticipated that more and more of the privately-controlled waters, once restocked, will be posted against trespass in order to restrict the benefits to private landowners. In order to maintain the public resource at approximately its present level, or to expand it, it will be necessary to institute an extensive program for public access to the streams now privately controlled. We envision a concentrated effort to purchase from riparian landowners permanent trespass easements to include stream bottoms and several feet of marginal land along the stream banks, so that public trespass will be permanently assured as the level of the trout fishery is improved.

"So far as the Appalachian Program is concerned, the pursuit of these two suggestions would go far toward ameliorating the financial difficulties of our mountain residents. The purchasing of permanent trespass easements along desirable trout streams would be a financial boon to a great number of people. The subsequent stocking of fish to attract and hold tourists in the area would provide a continuing and very important source of income to the residents of the Appalachian Region.

"In planning the development of a program of superior trout fishing as a cornerstone of the North Carolina Appalachian Program, we find several considerations to commend it.

"Seasonally, the visitors come to our mountains during the summer. The season for stream fishing for trout extends from the first Saturday in April to November first. Some lakes are open to year-around trout fishing, but the total resource is available during the entire tourist season.

"The suggested program of purchasing permanent public-trespass easements along trout waters will provide immediate cash benefits to landowners over nearly the whole Appalachian Region, including those in very remote areas who may be in the greatest need.

"Construction and operation of the necessary trout hatcheries will produce local benefits of a high order in terms of original construction expenditures, as well as providing permanent employment in the more remote areas.

"The development of a high-quality trout fishery will produce economic opportunity for residents in communities as well as the most rural areas. All who supply goods and services to the fishing tourists will benefit - now and for the future. This will not be a 'one-time' benefit, but a continuing one.

"The potential trout fishing tourists will be drawn from the most populous centers of the southeastern United States. A four-hundred mile radius from the center of our Appalachian Region, a reasonable distance for the tourist fisherman to travel for his fishing vacation, will reach such major cities as Washington, Baltimore, Cleveland, Indianapolis, Memphis, Birmingham, Tallahassee, and Jacksonville. As these urban populations expand, so will our benefits from the program we suggest. The cost of such a program will be very expensive, and will represent a cost which the Wildlife Resources Commission cannot finance without additional sources of revenue."

Game Management

The Wildlife Resources Commission has a program for the restoration, protection, and management of our wildlife resources. In Appalachia, as in other parts of the State, this program is limited only by the funds available to the Commission.

In a memorandum calling for a new approach to the problem, Frank B. Barick, Chief, Division of Game, has outlined the problem and offered some solutions worthy of consideration. Mr. Barick says:

"The major opportunities for wildlife (game) to contribute to the economic improvement of Appalachia are through programs related to intensified big game management. For purposes of

big game management the land in Appalachia may be classified as follows:

- 1) Areas of no or low potential, i.e., municipalities, communities, major farming areas - about 40% of land area; and,
- 2) Areas of substantial potential, i.e., major forest areas - 60% of land area.

"This latter category may be further divided into five classes as follows:

- a) State-administered wildlife management areas currently supporting near-capacity deer herds - about 380,000 acres;
- b) U.S. Forest Service lands not in wildlife management areas and available for more intensive development through expansion of existing cooperative program with Wildlife Resources Commission - about 630,000 acres;
- c) Industrial forests, which are suitable for big game development because they occur in fairly large units - 519,000 acres; and
- d) Privately-owned forests, most of which are suitable for development through local cooperative program - 2,637,000 acres.

"Major opportunities for Federal help to local economies based on big game production and harvest may be listed as follows:

- 1) Jobs on State-administered wildlife management areas would supplement the present program of development on these areas to accelerate completion of work currently programmed over a long-range period. A major job to be done is improvement of access by completion of a foot trail system, designed to improve access for hunters and fishermen as well as for fire protection and forest management. Subsequent maintenance would require a lesser amount of effort. It is estimated that implementation of such a program would have as its initial goal the establishment of about one mile of trail for each thousand acres of management area, or about 380 miles in all. At 20 man-days per mile this would require about 7,600 man-days for establishment or about nine or ten four-man crews one year. Annual maintenance would require about one-third to one-half this effort.

It should be noted that these jobs would offer employment primarily to those who, because of lack of education or other reasons, are unable to secure gainful employment here or elsewhere. It should also be noted that, for implementation, current commission budgets would require an additional \$100,000 the first year, and half this amount in subsequent years for maintenance.

2) Loans to landowners or cost-sharing programs could be provided for land management practices designed to increase big game production (and also accelerate timber production). These would include browse cutting by means of timber stand improvement; i.e., thinning young unmerchantable stands by chopping down weed trees, the sprouts of which provide browse for deer. Such a program would be beneficial to both industrial forest owners and private forest landowners and because of its long-range conservation nature, should be at least 90% Federal money. This kind of work, as in 1) above, would also be primarily of benefit to the uneducated or uneducable; and because of the extensive acreages of land where this treatment is needed, it could provide employment to several hundred workers indefinitely into the future. Cost and employment potential may be estimated as follows:

two man-days per acre (about \$20), and applicable
1% to 10% of total commercial forest land per year

"Another practice would be the planting of pastures to increase food for deer. Since this could also be put to more immediate use in cattle production, a lower participation rate would be appropriate. The 25-acre, 80% payment schedule proposed in the farm improvement section of the Appalachian Program would fulfill this need, provided that it were allowed for deer production as well as cattle production, for as we have pointed out elsewhere, deer production could be more profitable than cattle production.

3) Technical services would be required to supervise, 2) above, and to help landowners develop new sources of income from accommodating hunters and providing guide service, as well as conducting a public relations program to develop community cooperation necessary to the success of a program based on a mobile publicly-owned resource as wildlife. One or more full-time personnel per county could be profitably used to accomplish this objective. These men should have professional training in wildlife and/or forestry, agriculture, public relations.

"Benefits accruable to the economy of Appalachia from wildlife-based programs may be classified as:

a) immediate and direct, i.e., in terms of employment of people bypassed by our increasingly technological society;

b) short-range and long-range direct, i.e., in terms of income to landowners from sportsmen and from increased and accelerated timber production; and

c) indirect - i.e., increased income to local businesses from more jobs for local people and more tourists (hunters).

"The money value of big game hunting may be computed as follows:

"According to surveys conducted in North Carolina, it requires an average of 20 man-days of hunting to kill a buck deer. Using a low figure of \$3 per day for hunting permit, 20 man-days of hunting produce an income of \$60. (Many property owners currently charge from \$5 to \$20 per day.) Guide fees at \$5 per day would add another \$100 to the value of each deer killed. Lastly, a conservative \$7 per day for food, lodging and supplies would amount to an additional \$140 per deer. This amount would stay with people who provide these supplies and services. Thus, the 'recreational value' of each deer killed may be conservatively estimated at \$300.

"The overall potential value to be derived from implementation of an intensified program of big game management on commercial forest land in Appalachia (other than the wildlife management areas where it is already in effect) may be computed as follows:

land area - $630,000 + 519,000 + 2,637,000 = 3,786,000$ acres
potential deer population @ 40 acres per deer - 94,650 deer
potential annual harvest at 20% of population - 18,930 deer
total annual value to economy at \$300 per deer harvested - \$5,679,000.

"Any resource that can contribute \$5,679,000 each year to the economy of an area the size of Appalachia is worthy of careful consideration. And it takes on added significance when we realize that it would require only a fraction of this amount in outside help to get it started, and still less to keep it going. Furthermore, this resource and income are available on a sustained basis, so long as proper management is employed.

"Development of this resource is highly compatible with other land-use programs. We have already pointed out its compatibility with timber production and cattle production. It is also compatible with health programs in that it would provide abundant healthful outdoor recreation. It is especially compatible with one aspect of the public health program; namely, that having to do with rabies prevention through control of stray dogs. Indeed, control of stray dogs would be a primary requirement for success of a deer restoration program. It is compatible with road and access development, not only in that it can provide employment for laborers in foot trail construction, but also in that it would benefit from road and highway construction; particularly if these were so designed as to improve existing routes rather than further fragment our fast-

diminishing wilderness, for it is upon the preservation of that wilderness that realization of the wildlife potential depends."

The program and personnel of the Wildlife Resources Commission can and will implement many of the projects suggested in this report, provided additional funds are made available for State matching purposes.

Potentials for Economic Development
in the Appalachian Region of North Carolina

Dan E. Stewart, Director
N. C. Department of Conservation and Development

You have just heard from Highway Commission Chairman Joe Hunt a most excellent presentation on Interstate and Appalachian Highway Programs for the Appalachian Region.

The completion of this highway system will offer the most significant long-range development opportunities for this Mountain Region that have occurred since Daniel Boone blazed the trail through these hills to the West. It will shorten travel time and distance to markets, open up attractive industrial sites, make many timber growing and mineral resource areas more accessible, cut down travel time for tourists into the area, and generally make it more accessible for the development of our natural resources and an influx of tourists. These developments, however, will not be automatic by virtue of completion of this highway system and it has never been expected this would be the case.

I sat in many conferences in Washington, even before the Appalachian Commission was created by the Congress, discussing the philosophy back of the Appalachian Program. I think it was clear to everyone concerned that funds invested by the Federal government, state government, and local government for certain basic required facilities could only be considered seed money or stimulant money. It was recognized from the start that if these basic facilities could be provided by governments, opportunities would be presented to the private sector of our economy for development, and that such private investments would eventually be many times the total of all government expenditures, thus creating new wealth in the area by enhancing land values, and by creating new jobs for our people and establishing an accelerated growth pattern.

I think it is clear to all that highways would head all priority lists. Closely paralleling the need for highways, however, is the need for an adequate supply of potable and industrial water and the necessary water pollution control facilities to keep our waters clean. No area can expect to grow very much unless water and sewer facilities are expanded well beyond immediate needs. The development of adequate water and waste facilities is not intended to be a response to existing population and industrial concentrations in need of these vital facilities (although this is the case in a number of areas). It is, rather, an incentive to attract those with imagination and venture capital, to develop tourist attractions, to construct suitable tourist accommodations, and to make it possible for industry to come to Appalachian North Carolina. This would not only halt the present out-migration trends in

many counties of the Region, but would establish an accelerating growth pattern.

We know water and sewer costs a lot of money, and that it is impossible, because of tremendous investments required, to even consider immediate construction of adequate water and sewer systems in all areas of the 29-county region. It, therefore, appears a practical course to select certain areas for accelerated development where population centers, livability, topography, rail service, and other factors combine to be the most likely growth areas in the Region.

For this purpose, economists and engineers have been employed by the State of North Carolina, with assistance from Appalachian Commission funds, to make recommendations as to where the greatest growth potential centers are. Seven such areas have been so designated for consideration and at this point, I would like for you to look at a slide which will locate each of the seven suggested corridors, proposed for priority development, and let you see their relationship to the 29-county region.

In each one of these corridors, planning is being done to determine the best method of providing adequate water and sewer for accelerated growth. We know the cost may be too great to install all suggested facilities on the first project - they will probably have to be staged with relation to medium range needs and financial capability. But with a long-range plan for such facilities, each staged investment could be made with assurance that it serves the best purposes for corridor growth.

Of tremendous importance is the matter of financial assistance available for corridor basic facilities development. By virtue of its geographic location and economic circumstances, Appalachian North Carolina is eligible for financial assistance under almost every Federal grant program now existent. Some of the major programs, however, are geared to matching state funds, and the development of some program of state funding within North Carolina is probably essential to the optimum development of water and waste systems. Even so, in all water and sewer projects, local governments must take the lead in their initiation, and they must bear a major part of the cost.

Once long-range systematic plans are made and accepted in principle, it would enable all counties and cities involved to avoid isolated expenditures that would not fit into the long-range plan; and therefore make it possible more efficiently to utilize available funds for the ultimate plan which generally can be accomplished in stages.

The engineers' long-range plan for each of the seven corridors* will provide for approximately 40 years accelerated growth when completed and will be a report:

* See Section II of this Report.

- 1) Projecting ultimate growth within each corridor.
- 2) Defining the optimum water and waste systems to accommodate such growth.
- 3) Estimating total and net costs of such systems.
- 4) Outlining alternate methods for securing necessary annual revenues.
- 5) Setting forth recommended priorities based upon immediate corridor needs and cost-benefit ratios for the individual corridors.

With this data in hand, local governments may determine specific objectives and priorities for projects, initiate, design and construct these vitally needed utility systems in stages, with such assistance as may be available from Federal and State sources.

As an example, I would like to discuss some of the major points in just one of these corridors, which extends from Andrews to Murphy.

This is the most western of the corridors studied, lying adjacent to the North Carolina-Tennessee border. Murphy and Andrews are approximately sixteen miles apart, on U.S. Route 19.

The corridor essentially comprises Murphy, its northwest satellite community of Texana, Andrews, and the small community of Marble, lying between the two population centers along Route 19. An estimated 1967 population of 4,200 people represents 26% of the entire Cherokee County population. For all practical purposes, both from the standpoint of population concentration, industrial development, and geographic location, the Murphy-Andrews corridor dominates Cherokee County.

Under conditions of optimum development, it is felt that the Murphy-Andrews corridor resident population could reach 14,500 by the year 2015. However, from the standpoint of land availability, water resource potential, and watercourse assimilative capacity, the corridor can accommodate a population of 40,000 people or 25,000 more with accelerated development than with normal growth. This means that a major opportunity to develop new jobs, greater income, greater population growth, and consequent increase in real estate values is not only possible, but may be expected in the form of manufacturing, tourist attractions and accommodations, or other resource use, but only if local initiative wants it that way and is willing to take the lead.

A study of alternative systems suggests that the corridor will be best served by a regional water system with a reservoir on Junaluska Creek above Andrews, a water treatment plant adjacent to the impoundment, and transmission mains to serve Andrews, Marble, Murphy, and its environs. The ability of such a system to serve the entire corridor by gravity

rather than by pumping is a significant economic advantage, and can be shown to justify the substantial cost of a Junaluska Creek impoundment as opposed to the use of Hiwassee River water, and pumping in the entire corridor. A further advantage of the Junaluska Creek Dam is its flood control aspect, which will render substantial land areas now in the flood plain amenable to industrial development.

The regional sewerage system contemplates an interceptor between Andrews and Murphy, with a major secondary waste treatment plant below Murphy on the Hiwassee River. Again, the entire corridor is served essentially by gravity.

It is proposed that the initial construction of these systems be limited to facilities which are vitally needed now, taking cognizance of the capacity of existing independent water and waste systems. Such staged construction will not only make optimum use of existing facilities, but will also minimize the annual cost of regional facilities to the present corridor population.

The total estimated costs of the water and waste systems for this corridor are \$6,900,000 and \$3,500,000, respectively; or a total of \$10,400,000. If maximum grants are realized, the total local capital cost can be reduced to approximately \$2,400,000. It is conservatively estimated that the development which these utilities will attract to the corridor will, at present day methods of determination, increase the corridor assessed valuation by \$15,000,000.

The Murphy-Andrews corridor has been discussed very briefly only to present the concept of what is being done in each of the seven corridors. At this point, I would like to show you slides of the other six corridors. Time will not permit discussion of plans for these areas today.

However, when the studies of these seven corridors are completed sometime this fall, meetings of the leaders of the public and private sectors of the economy surrounding each corridor will be invited to hear a detailed presentation of what is proposed in each of the corridors.

My presentation today is intended to bring you up to date on the direction of planning in the North Carolina sector of the Appalachian Region and to challenge the best of thoughts of the public and private sector of the Region's economy to put their thinking caps on and begin to determine how such planning might be implemented and financed, how local investors and people can capitalize on the opportunities that will be unfolded, and begin a search for outside investors if such is indicated.

At this point, I would like to point out a few specifics that have occurred to me. I am sure you may think of many others.

1) Within the last ten years in the 29-county region, 302 new industries have been established and 619 industries have made expansions. They have invested more than \$800 million in new plants and expansions, and have created new annual payrolls totalling \$245 million in the process of creating 68,000 new jobs.

If all the planning can be implemented, it would seem to me that it would be possible, perhaps, to double this within a ten-year period after the proposed highway system is ready, provided water and sewer facilities are kept sufficiently ahead of present needs to meet growth demands.

2) In 1966, the value of minerals produced in the 29-county region was \$17 million. It would seem that the opening of the highway system should open up new vistas for the economic development of more of our mineral resources.

3) The value of primary forest products in 1964 was \$45 million in the 29-county region. The 1964 Forest Survey shows that the net growth of both the softwoods and hardwoods exceed annual cut by a substantial margin. However, the large proportion of low quality timber in the inventory, particularly in the hardwood species, presents a major problem in developing the forest resources in the area. Much of the net annual growth is on the poor quality trees, culls, and inferior species which have very limited utilization. Present growth on these low quality trees is also far below the potential of fully stocked stands of desirable species. Market demand already exceeds the growth of quality timber from desirable species. For example, North Carolina presently cannot supply the demand of the wood furniture industries who find it necessary to import 55% of their current needs.

Only 12% of our timber land in North Carolina is owned by mills. Their stands are well managed. Nineteen percent is in public ownership. The remainder is owned by individuals. About 70% of the total is in ownerships of 500 acres or less. The timber growth in North Carolina's forests as a whole, just about equals the drain. If ways are not soon devised to substantially increase our timber growth, the rapidly increasing demand by industry for forest products will place our \$1 billion per year wood-using industry in jeopardy. It becomes clear that growth increase must come substantially from ownerships of 500 acres or less. This involves genetic improvement of the most promising species, particularly for hardwoods, the development of economical ways to replace a scrub growth and unusable woods with selected quality seedlings, so as to make well-managed timber growing more profitable to the grower.

There are 3.3 million acres in this area which need either timber stand improvement or tree planting or both. These stands are now 40% or less stocked with desirable trees. Treatment is necessary to bring these to acceptable productivity.

The growth on the treated acres would be increased 60% over the present rate. Based on today's prices, these stands would return an average of \$14.00 per acre per year when carried through a sawtimber rotation.

As a starter, the Department of Conservation and Development this year purchased a 475-acre tract of land in Avery County which will be devoted to genetic improvement of hardwood tree stock, the production of hardwood seedlings and development of better methods of hardwood planting, and the production of fraser fir seedlings for the Christmas Tree industry.

This region should seriously consider entering into a program oriented to the grower's needs in management practices and financial ability under the guidance of the North Carolina Division of Forestry, with such other assistance as may be available.

4) With the completion of the Interstate and Appalachian Highway programs, I believe, the potential for a well-rounded and healthy tourist economy in the Appalachian Region of North Carolina will be unparalleled anywhere in the Southeast.

Even today, millions of people come to our mountains every year - to drive along the Parkway, to fish in our streams, to witness the spectacle of autumn in the Great Smoky Mountains, and millions more will be on their way as the new highways are completed.

But the needs of Appalachia, at least insofar as tourism is concerned, we must not be satisfied simply by providing access. Many of the counties which now have good roads, and are visited by millions of tourists every year, have not realized the full measure of their potential simply because they have failed to provide facilities equal to the demands of the travel market.

This is a beautiful country, and people from all over the world come here to view the splendor of our mountains. In a sense, they're here at our invitation. The State of North Carolina spends a lot of money every year encouraging people to come to our State. The results have been overwhelming. Thirty-four million tourists came to North Carolina last year. A great many of these people came to the mountain region. But if we hope to realize any sort of return on our investment, we must continuously strive for more and better attractions and new attractions that will encourage them to stay longer and spend more of their money while they are here. The need for new and additional places of lodging, as well as imaginative attractions and recreational facilities, is great. In providing these facilities and services, we would be creating new income as higher land values, and a higher standard of living for our people. That is what this Appalachian Region Program is all about.

We are convinced that the future development of tourism as a major industry in the Appalachian Region of North Carolina will be restricted only by the interest of private investors, upon whose shoulders the larger burden of development must fall.

Without these proposed new highway facilities, spending by travelers in the 29 counties of the Appalachian Region has increased nearly 80% - from \$174 million to \$314 million - during the seven-year period from 1960 to 1967. Where the new highways are already, and if enterprises accept the challenge of providing attractions, accommodations, and recreational facilities, this growth rate could be rapidly accelerated.

In a certain few of the Appalachian counties, substantial investments have been made toward the development of new and additional travel facilities, where income from tourism has increased much more rapidly than in counties where investments have not been made.

The principle growth factors of tourism are closely related to the increased leisure time, increased income, and the compulsion of an affluent society of travel. They are seeking quality attractions, courteous service, and comfortable accommodations. The affluent public will spend their money some place. The private sector of the economy will, by its actions, or inaction, determine whether the tourist dollars will be spent in western North Carolina, or in some other more imaginative and investment-minded section of the country.

In summary, the State of North Carolina and the Federal government are developing plans to serve as a guide for creating job opportunities for people in the Region through development of industry, mineral resources, forest resources, and tourism. This potential growth pattern is being seeded by State and Federal funds. Beyond this point, local governments and private investors must take over and nourish the development of water and sewer facilities which are basic requirements of growth, before substantial industrial or tourist development can occur. Private investors will follow where adequate facilities are available.

The challenge is to every local government, every landowner who seeks appreciation, and every investor with imagination, as well as to every person in the Region who hopes for better job opportunities for this and succeeding generations.

The challenge is ours - what will we do with it?

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TABLE 1
LAND AREA AND COMMERCIAL FOREST LAND
BY COUNTY AND OWNERSHIP
APPALACHIA - NORTH CAROLINA - 1964/

County	All Land (Thousand Acres)	Commercial Forest (All Ownerships) (Thousand A - Percent)	Public Ownership Thousand Acres		Private Ownership
			National Forest	Other Public	
Alexander	164.0	98.8	60.2		98.8
Alleghany	147.2	66.1	44.9		66.1
Ashe	273.3	149.0	54.5		148.9
Avery	158.1	126.2	79.8	.1	105.1
Buncombe	412.8	290.9	70.5	26.1	235.8
Burke	323.8	239.0	73.8	9.7	191.3
Caldwell	304.7	227.3	74.6	1.1	177.3
Cherokee	290.6	259.8	89.4	6.8	171.9
Clay	136.3	114.4	83.9		55.8
Davie	168.9	74.9	44.3		74.9
Forsyth	271.3	133.7	49.3	1.2	132.5
Graham	185.0	172.7	93.4	2.2	65.6
Haywood	347.5	193.4	55.7	7.7	133.0
Henderson	244.5	161.5	66.1		143.4
Jackson	316.8	267.2	84.3	17.6	223.2
McDowell	282.9	230.9	81.6	.9	165.1
Macon	330.9	274.3	82.9		132.7
Madison	291.8	216.0	74.0	1.5	168.9
Mitchell	140.8	111.0	78.8	2.2	93.1
Polk	149.9	110.9	74.0	5.3	105.6
Rutherford	362.2	255.7	70.6	.3	255.4
Stokes	293.8	179.1	61.0		179.1
Surry	343.7	193.5	56.3	.6	192.9
Swain	339.2	114.8	33.8	30.5	68.5
Transylvania	242.3	212.3	87.6	.7	128.2
Watauga	204.8	121.1	59.1	.4	120.5
Wilkes	488.3	365.8	74.9	6.2	359.6
Yadkin	214.4	99.2	46.3	.1	99.1
Yancey	199.0	142.8	71.8		120.1
TOTAL	7628.8	5202.3	868.8	121.1	4212.4

1/ North Carolina Timber, 1964.

TABLE 2
VOLUME OF SAWTIMBER AND GROWING STOCK
BY COUNTY AND SPECIES GROUP
APPALACHIA - NORTH CAROLINA - 1964 1/

County	SAWTIMBER				GROWING STOCK									
	All Species	Yellow Pine	Other		Soft Hardwood	Hard Hardwood	All Species	Yellow Pine		Other		Soft Hardwood	Hard Hardwood	
			Million Board Feet	Hardwood				Softwood	Thousand Cords	Softwood	Hardwood			
Alexander	70.8	20.6			8.3	41.9	571	158		7		117	289	
Alleghany	165.9	3.1	5.7		43.5	113.6	714	33		22		193	466	
Ashe	397.1	11.4	27.5		70.9	285.3	1,892	111		146		434	1,201	
Avery	237.8	2.2	36.4		96.2	163.0	1,594	10		142		532	910	
Buncombe	344.1	59.1	41.6		153.9	594.5	3,723	302		153		769	2,499	
Burke	546.6	99.4	131.5		58.3	257.4	2,990	778		449		427	1,336	
Caldwell	532.7	99.5	135.4		101.6	246.2	3,002	626		457		585	1,334	
Cherokee	540.0	163.5	26.4		88.8	261.3	2,762	878		91		471	1,322	
Clay	236.2	20.0	1.3		22.4	192.5	1,049	82		3		116	848	
Davie	152.7	24.1	1.2		53.9	73.5	824	237		11		246	339	
Forsyth	298.0	93.0	1.1		83.7	120.2	1,745	630		15		486	614	
Graham	594.3	78.0	30.7		142.4	293.7	2,550	345		235		630	1,340	
Haywood	488.6	19.8	22.2		131.7	314.9	2,284	95		132		667	1,390	
Henderson	617.9	39.4	95.6		94.2	388.7	2,659	202		276		476	1,705	
Jackson	663.3	12.5	73.9		137.5	439.4	3,124	73		207		794	2,050	
McDowell	570.9	103.2	25.8		72.5	369.4	2,914	589		80		419	1,826	
Macon	812.6	44.1	100.0		135.8	532.7	3,597	229		313		791	2,264	
Madison	601.7	28.5	98.0		134.3	340.9	2,941	218		305		720	1,696	
Mitchell	243.9	1.4	26.4		65.7	150.4	1,434	6		113		493	882	
Polk	177.0	52.4	10.1		28.4	86.1	963	355		26		162	420	
Rutherford	300.0	132.4	1.9		36.9	128.8	2,063	1,035		6		216	806	
Stokes	327.1	92.0	1.4		62.2	171.5	2,001	679		4		500	618	
Surry	255.4	100.4	4.0		42.3	108.7	1,894	734		17		347	796	
Swain	242.5	34.3	6.2		34.5	167.5	1,277	264		22		173	818	
Transylvania	306.5	48.2	69.4		167.2	521.7	3,439	219		215		774	2,231	
Watauga	276.2	85.5	85.5		57.5	133.2	1,387			220		397	770	
Wilkes	770.1	220.2	109.9		118.8	321.2	4,841	1,607		429		895	1,910	
Yadkin	270.8	162.3			19.5	30.0	1,410	848				148	423	
Yancey	459.2		120.8		84.3	253.6	1,013			318		429	1,160	
TOTAL	12,702.4	1,765.0	1,341.0		2,347.7	7,160.8	63,566	11,343		4,414		33,407	34,402	

1/ North Carolina Timber, 1964

ANNUAL HARVEST OF FOREST PRODUCTS
APPALACHIA - NORTH CAROLINA - 1964 3/

Cooperage - Dimension, etc.	260,000,000 bd. ft.
	16,000,000 bd. ft.
	3,500,000 bd. ft.
Misc. cord wood products	305,370 cords
	11,600 cords

VALUE OF PRODUCTS HARVESTED ANNUALLY (STUMPAGE)
APPALACHIA - NORTH CAROLINA - 1964 4/

Cooperage - Dimension, etc.	\$ 5,200,000	
	600,000	
	100,000	
	750,000	
	<u>20,000</u>	
Total Stumpage Value		\$ 6,670,000
Value added through harvest (x 1.5)		10,050,000
Value added through primary processing (x 3.85)		<u>25,679,500</u>

ESTIMATED TOTAL VALUE OF PRIMARY FOREST PRODUCTS
 PRODUCED IN APPALACHIA (1964 production - 1967 values) \$42,399,500

The primary product values can be doubled or tripled by manufacture into finished products by Secondary Manufacturing Firms.

3/ N. C. Division of Forestry, "Forest Products Drain Survey" 1964.
4/ Stumpage Values estimated by N. C. Forest Service and based on sale records of private stumpage sales.

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Priorities and Order of Magnitude for Public Investments to Optimize
Development of Forestry Resources

Fire Protection Objectives

To improve timber productivity and quality.

To improve water quality and quantity by reducing peak run-off flows
and sediment.

To improve recreational and wildlife resources.

To maintain and improve the natural beauty of the area.

PROPOSED BUDGET

Fire Crewleader	\$5,600.
Equipment Support Personnel	32,000.
Tower Operator & Fire Crewmen	32,330.
Fire Suppression Flowing Unit	<u>62,384.</u>
TOTAL	\$139,314

The additional equipment and personnel that these funds will supply
will enable the Division of Forestry to meet present deficiencies in
fire protection organization.

These funds will allow the Division to give additional employment to
part-time employees and to employ additional full time personnel.

Priorities and Order of Magnitude for Public Investment to Optimize
Development of Forestry Resources

Forest Management Objectives

The 1964 Forest Survey shows that the net growth of both the softwoods
and hardwoods exceed annual cut by a substantial margin. However,
the large proportion of low quality timber in the inventory, particularly
in the hardwood species, presents a major problem in developing the
forest resources of the area. Much of the net annual growth is
on the rough trees, rotten culls, and inferior species which have
very limited utilization. Present growth on these low quality trees
is also far below the potential of fully stocked stands of desirable
species. Markets already exist for the quality product from desirable
species. North Carolina presently cannot supply the demand of the
wood furniture industries who find it necessary to import 55% of their
current needs.

Opportunities for narrowing the gap between the present growth and potential growth and between current utilization and potential utilization are multiple.

1. Timber Stand Improvement on 1,660,000 acres of Condition Class 3 land. Present conditions on these areas prevent establishment or inhibit growth of desirable trees on 30 to 70% of each acre.
2. Tree Planting, with site preparation when needed, on the 1,700,000 acres of Condition Class 5 and 6 land which are presently less than 40% stocked with desirable trees.
3. Development of strains of trees of superior quality, form, growth rate and resistance to insect and disease and the production of planting stock from such trees for reforestation purposes.
4. Development of products and markets which utilize the poor quality trees for fibre and other non-lumber products. The market is needed as a means of removing the presently non-profitable growing stock without excessive cost to the landowner. On many areas such a market could provide a return sufficient to cover the cost of establishing a new stand of the superior trees being developed.

Costs of Timber Stand Improvement and Tree Planting range from \$20.00 per acre to \$60.00 or more per acre. At an average cost of \$40.00 per acre the total cost of bring one-half of the area into full potential over a 10 year period would approximate 8 1/2 million dollars per year.

The growth on these 1.6 million acres would be increased 60% over the present rate. Returns of \$14.00 per acre per year can be expected from areas fully stocked with desirable trees if carried through a 40 year rotation. Increasing growth by 60% on the 1.6 million acres will yield over \$13,000,000.00 per year.

When the values added through harvesting and manufacturing are included the net return to the Appalachia Counties of North Carolina through improved forest growth can be increased to \$69,000,000.00 per year by the end of the 40 year rotation.

The above projections of increased returns from the forest improvement practices are based on the assumption that markets for products from the desirable trees will continue to develop.

Compatible Recreation and Resource Utilization
(in Joint Economic and Societal Development)

By: Ralph J. Andrews, Director
North Carolina Recreation Commission

The evolution of recreation and parks as related to the field of economics had its beginning a long time ago. Economists and the public in general have thought of recreation only in terms of being good for the souls of men. It is this, but during the 1940's, the fields of medicine, psychiatry and social institutions utilized recreation as a preventive and rehabilitative force for use with those harboring physical, mental, emotional and criminal problems. During the 1950's, we found many of our finance-based institutional research centers taking a careful look at the financial returns which can be derive through carefully planned investments in recreation and park operations, and in related fields of business and industry.

Before we are misled or misdirected, therefor, by looking only at the cash register, which records only those immediately identifiable returns from recreation, it might be well to create a better common understanding of economic potentials, and of terms which can be used for establishing a common base of understanding.

Terminology

With the quickening tempo of evolution of recreation and park developments, and of their relationship to economics, is greater awareness by the professionals within these broad fields of recreation endeavor, along with those from the allied fields. All of these with the alert laymen are trying to apply terms and concepts that will be understood by all concerned. Some of the basic terms are:

The term recreation means recreation and parks. This is accepted by the local government, the North Carolina Recreation Commission, the North Carolina Recreation and Park Society, and the National Recreation and Park Association.

The term resource, as considered in its broad concept, means human resources as well as natural and man-made resources. Natural and man-made resources are for people; therefor, coordinated planning for all resources must be constantly related to the needs and wishes of people.

The term community can mean the nation, a state, a county, city, town or combination thereof. The community whole is generally determined by the people's use of an area which is influenced by the facilities developed on land and water acreage.

The term public recreation normally refers to any recreation administered by agencies created by a government body.

The term private recreation refers to any recreation administered by United Fund agencies, religious organizations, industries, private clubs, civic clubs, and similar agencies.

The term commercial recreation refers to recreation administered by corporations or individuals investing money for a profit. Recreation investment for a profit usually provides a level or a type of service not available through government or private, non-profit organizations.

Suppliers of recreation and park services consist of public (all levels of government), private non-profit, and commercial (for profit).

Statement of Objectives (and Principles)

As North Carolina prepares to more fully meet her obligation in the leisure demands of out-of-state visitors, as well as those of her citizens, certain cardinal principles and objectives are recognized which form a recreation philosophy in the State. The general principles are:

(1) That recreation takes its place with education, health, religion, welfare and work as one of the six essential factors affording people total living opportunity.

(2) That patterns of desirable outdoor recreation, planned and developed into effective programs of activity, are required in our democratic society of free enterprise.

(3) That what is done should be focused upon the local level - the enrichment and advancement of recreation in our local communities for individual and group enlistment. This is the base upon which all recreation is properly developed.

(4) That we are interested in the full participation of all our people - children, youth, adults, and elders, and of all economic and social strata and all races.

(5) That we stress the utilization of the talents of our people and of our natural and man-made resources in the development of facilities and program, and of all forms of recreation activities.

(6) That the recreation program be soundly financed, properly planned, and directed by professionally trained leadership.

(7) That the program functions through the coordination and planning of all types of agencies - public, private, and commercial - which bring the total of abundant and constructive recreation opportunity and the desired levels of participation.

(8) That we recognize recreation as a powerful economic force in the nation and in North Carolina; that it is rapidly assuming a place of great importance in our economy; and that it is an important employer of people, rapidly expanding producer of goods and the consumer of goods upon which our necessary gross national product expansion must depend for continued prosperity.

(9) That we recognize recreation as an essential force in the life of the people of the State, and that we must correlate it with the whole of community resources.

The Twenty-Point Recreation Program

In further realizing the full potential of all recreation, of all human and environmental recreation resources, the North Carolina Recreation Commission adopted the first "Twenty Point Recreation Program for North Carolina", October, 1945. Several revisions, the latest occurring in January, 1966, can serve the State well as policy statements which help to assure that recreation takes its proper place in the life of the people of North Carolina. By recommending that recreation remains in proper proportion to the total of all development throughout North Carolina, a wholesome program of activity, based upon sound planning techniques, can provide the proper base for meeting immediate and future recreation needs.

These policy provisions are used as a further prologue to the State's comprehensive recreation plan in making North Carolina an even more productive, economically sound, aesthetically beautiful, and leisure-oriented State in which to reside or to vacation.

Twenty Points

(1) Interpreting Recreation; (2) Coordinating Recreation Interests; (3) Refining Recreation Administration; (4) Improving Federal, State and Local Government Relations; (5) Promoting Fine Rural-Urban, County-City Relationships; (6) Giving Guidance and Help to Private Enterprise; (7) The Family; (8) Recognizing Industrial Program Benefits; (9) Adapting Recreation for the Ill and Disabled; (10) Promoting Successful Techniques and Practices in Religious and Private Organizations; (11) Encouraging Recreation Education; (12) Providing Leadership; (13) Stressing Professional Status; (14) Wise Use of Our Natural Resources (Conservation); (15) Planning and Research for Recreation; (16) Enriching Program Opportunities; (17) Stimulating Participation in the Arts; (18) Advancing Sports and Games; (19) Using Holidays and Festival Occasions; (20) Production of Resource Materials.

Further interpretation of these 20 points is found in the North Carolina Recreation Commission publication, No. 37, "The Twenty-Point Recreation Program for North Carolina".

Concepts

Recreation is to help people. Mr. M. C. Benton, Mayor of Winston Salem, which is an important municipality helping to serve the north-eastern section of North Carolina's Appalachia, is a past President of the North Carolina League of Municipalities, a leading North Carolina industrialist, and a Governor's appointee to North Carolina's legislatively created Zoological Garden Study Commission. Mayor Benton has emphasized in several recent speeches that, "In any area of urban planning, whether it be housing, traffic, recreation or whatever, the single never-to-be-forgotten goal is to help people. Simple planning in the manipulation of things in the hope that the manipulation will somehow help people is not enough." In his talk to the Southeastern Regional Council of Housing and Redevelopment officials, he said, they "will waste their efforts if they do not keep the public's social needs in mind as well as the physical needs."

There are some basic concepts which were presented to those now preparing to make the Appalachian Highlands Recreation Study. They are:

(1) North Carolina's recreation complex concept means regional consideration. Experience has shown that the recreation traveler, our own citizens or the out-of-state visitor, find it relatively easy to get to the point where they can serve many of their recreation needs in our State. Highways and roads in North Carolina, not usually jammed with vehicle traffic so much as they are in other areas, such as in the states to the north, poses the need and opportunity to understand travel in terms of time, and not only in mileage.

(A) There is need to bring together, in recreation complexes, broadly varied phases of recreation activity for people. There is need to capitalize on all of our natural and man-made resources. The recreation complex needs to function on a year-round basis if we are to develop recreation services that are practical, meaningful and economically beneficial.

No one activity, such as boating, may be required, year-round, but a composite of alternative recreation activity needs to be so programmed that people will want to flow into the region throughout the year. Year-round operation more nearly assures economic stability. This further means that personnel can be employed on an annual basis rather than only on a seasonal basis.

Year-round operation lends itself to better management, higher quality operation, and more economical services.

Recreation services for people must be built on the concept of public, private and commercial recreation management coordinating and cooperating to the fullest extent possible. Government recreation and park managing authorities strategically serve as the focal

point for all forms of recreation within their own governmental area. Government is to see that recreation opportunity is provided for the public but not, necessarily, to do all of it.

There are not enough public monies, even by combining all funds from all levels of government, to meet the existing and, especially, all of the future recreation needs of our people. North Carolina has had exceptional success in causing the joining of these three forces in meeting people's recreation and park needs. This cooperation has particular merit in western North Carolina.

In order to create governmental focal points for recreation in western North Carolina, it is foreseen that every county will establish a county recreation service. Many times there may be a combining of two or more counties and cities, so that they can financially afford the creation of a broad recreation and park development with professional, year-round personnel.

As recreation travelers come into western North Carolina, it is noted that they tend to stay within a sub-region during their day travels and excursions. They tend to establish a temporary base. Thus sub-regions should be planned using the total recreation complex concept. Recreation activities, as well as land and water-based recreation areas and facilities, should be planned and developed so that each area meets the criteria of a complete recreation complex. It should supplement but not wastefully compete with all others. In other words, each region should be largely self-sufficient. This will not prevent the travelling public from seeking its recreation throughout more than one sub-region. In each case, however, the guest-day record will be enhanced.

The recreation traveler very seldom will try to participate in an activity which is not familiar, or in one in which there is a lack of his already developed skill. The recreation traveler seeks recreation activity which is familiar to him, but he is experiencing it in a different setting. Few people like to play the same golf course, swim in the same pool, ride at the same stable, or talk with the same people all of the time.

Likewise, there is a need to have a variety of activities ranging from those which are natural resource-based to others on historical sites, to outdoor drama, and in sports areas all of which can fit so well into our natural resources setting in western North Carolina.

(3) There is need for North Carolina, particularly with our local people, to plan new forms of recreation rather than only to project what already exists. Validity of people-interest surveys is restricted by survey content, and is limited by existing skills and the recreation experience background of the user. Ten years ago no one in North Carolina could have, realistically, projected or marked a survey form for skiing interest. Yet skiing, today, has made its important economic impact on western North Carolina.

We have few inquiries about ice skating, and no mention of tobogganning. Add these two activities to skiing and there will be another increase in people's recreation interests, and in economic benefit. Very little thought, beyond bars and swimming pools, has been given to social recreation for those staying in hotels, lodges and motels. This can become an important family recreation travel magnet.

There are mountain resort areas which stay busy 10-1/2 months out of the year. There is no reason why western North Carolina cannot develop year-round recreation business. This is but a small sampling of why there is need for planning for the new rather than only to project the old recreation forms.

(4) There is such a thing as a limit on potential development regardless of demand. Because of required elevation, temperature and northern exposure there can only be but so many skiing areas, until the age of science provides equally good synthetic ski surfaces. There is a limit as to the number of skiers which can surely use a ski area of any given size. Despite the demand by people, western North Carolina will, thus, be limited as to how many skiers it can accommodate. The same will be true for water-based recreation and other recreation areas and facilities. Thus the need for variety as well as quantity.

Carrying capacity figures for recreation activity areas can be developed. In fact, the North Carolina Recreation Commission has made the initial "stab" in this direction. It will be, however, up to North Carolinians as to how much of a people-load they wish to see using their areas and facilities. Engineers, recreators, scientists and naturalists can determine ways to better manage areas in accordance with planning proposals. It is going to be up to you and our State officials to develop plans which will, in turn, determine how many people will be utilizing our recreation and park resources. Qualified leadership will, of course, increase the carrying capacity of many recreation facilities and areas.

(5) Recreation and park areas and facilities are being constructed in every state at a very rapid rate. Most anywhere you will find excellent man-made recreation resources within easy travel distance. There are relatively new natural resource areas, however, particularly as extensive as we find in western North Carolina. It would take anyone a long time, and is often impossible, to change our natural resources into man-made, quick-return, economic potential, even if this were desired. We must realize that a natural resource can never be replaced. If North Carolina wants to conserve them, then it will behoove State and local planners to consider the extent of preservation and reservation that will be necessary before these natural resources are lost for our present generation as well as to people in the generations that will follow us. We have a heavy burden to carry when making judgements of resource use.

(6) Appalachian Highland Recreation Study officials have inquired about areas of common concern. At present, it appears that western North Carolina has two large, major areas, the southwest and northwest regions. Within each region, it appears that several sub-regions can be identified. Each major region may have its outdoor drama. Each has its winter sports activity potential. Each has its historical sites. Only a part of the southwest region has existing water-based recreation areas of any significance. These recreation aspects, to be included in each region, can be considerably expanded by planning.

Summary

Recreation and park administrators shall increasingly become more aware of administrative, management and operational needs of those working with natural resources, so that people resources can be served and can be totally utilized, along with natural resources, for maximum benefit. To achieve this, we must involve those outside the recreation profession.

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Remarks by: Edwin Gill, State Treasurer, at the GOVERNOR'S
APPALACHIAN CONFERENCE, Asheville, North Carolina,
June 25, 1968.

As I have listened to those who have spoken on this program, I have realized that Appalachia may be viewed on the one hand as a whole bundle of problems, but looked at in another way, as a cornucopia of opportunities.

Any effort that is made to solve the economic and social problems of this great region is, of course, of more than local significance. Real progress made here will provide solutions that can be of great importance to the development of other areas outside the geographical limits of Appalachia. Superficially, this region and its problems may appear unique, but upon examination in depth, we realize that we deal here with people - people who some may say have been held back in their development because of the topography of the land and its remoteness from the great thoroughfares of trade and commerce.

As the roads that have been outlined there today are built, opening Appalachia to the great cities and markets of the nation, we must realize now is the time to prepare for progress. Never has it been more important for the agencies of government on all levels to plan and work together.

In my opinion, rapid development will come. Our concern is, what direction will it take? Will we conserve our natural and human resources? Or, will we permit this great region to be exploited, growing and expanding helter-skelter? I am convinced that there is no substitute for orderly and wise planning on the part of our governments and private enterprise.

In times past, private enterprise has led the way by developing projects that were deeply concerned with the living conditions of their industrial communities. Here in North Carolina, industries have, through the use of their own private capital, invested in housing, necessary utilities and other projects for the well being of their employees. Thus the private sector has often taken the initiative in area development. Particularly is this true when industry goes into undeveloped areas and through the expenditure of private funds, acts as a constructive catalyst, speeding the economic, industrial and cultural growth of the surrounding community. I sum it up this way: if private industry had not developed these industrial communities in remote areas, they would never have been developed!

Let me say here, with great emphasis, that we owe a debt of gratitude to private enterprise, which has in the past concerned itself in a practical way with the lives of people of their industrial communities. And let me say with equal emphasis, if we are to develop this region,

we will need the aid of government on all levels, but we will also need the help of private enterprise. In fact, the leadership of the private sector is often the necessary stimulant to the launching of projects which will challenge the governments on all levels into construction activity.

Once the plans for this region are lifted from the drawing boards, the eternal question comes up: Who is to pay the bill? There we run into not only questions of ability to pay, but also preconceived ideas as to whether it is proper for this or that governmental unit to bear the major part of the burden.

There are many people who think that local governments are not able to assume additional burdens incident to the development of this region. It is argued that the Federal government has preempted sources of revenue, and that the localities have a hard time carrying on the basic functions of government with the revenue sources that are left to them. They also say that the State cannot become too deeply involved in helping one area of the State without helping all areas, contending that it would require substantial increases in taxes at the State level, which might, along with other needs for revenue, put North Carolina in a non-competitive position with other states of the southeast in bidding for new industry. It is suggested that the money we get from Washington is really our own, that the Federal government does not have the problem of competition, that, in fact, it has a tax monopoly, and therefore we should look mainly to the Federal jurisdiction for financing public facilities.

And then, of course, there are those who take the doctrinaire position that we should not look to Washington for aid, contending that the more money we accept from our national government, the more of our independence we give up.

I think the answer is that if we are to make progress, we must lay aside our personal prejudices and take a long hard objective look at the importance of our goals. It is obvious to me that success will crown our efforts only if we have the wise and coordinated aid of government at all levels, as well as the private sector, which may in the end hold the key to great accomplishment.

We are influenced and inspired by far-reaching plans for this area. However, those of us who deal with finances must of necessity be cast in a questioning role. When great projects are discussed, we remember that they call for large sums of financing both public and private. So, if I seem to ask questions for which we have no ready answers, or if I flash a caution light, it is not necessarily because I am opposed to the projects recommended, but because I wish to see a dream translated into reality.

Regardless of our preconceived ideas about how the problems of Appalachia should be financed, one thing is clear. The counties and

cities will need all of the aid that the State is already giving and more. It is equally clear that Federal aid is a necessity. For the whole concept of Appalachia would be nothing but a piece of paper if it had not been implemented by funds from the Federal government, which have, to say the least, been generous. In addition, every local unit must be willing to contribute funds to the limit of its ability. Literally, no one will get a free ride. So in answer to the question: Who will pay?, the reply is: We will pay. And by that I mean all of us, one way or another. For this reason, we must insist that the plans for development be soundly based and efficiently executed.

The task of financing governmental facilities presents the same problems and follows the same procedural techniques as those applicable to private industry. You must have a credit standing. You must be able to show that the funds will generate sufficient earnings and benefits to insure repayment. And you must demonstrate a managerial capacity to handle the projects undertaken. The important point is that we must adapt the plans for financing to the situations that are unique to the localities involved. The means of financing that will fit the need and capacity of one unit may or may not work for the adjoining community. This, as you know, is no different from the practical situations that we are confronted with every day in our own private lives.

In thinking of the services that the State can render to Appalachia, we naturally think first of the State Highway Commission, the Department of Conservation and Development, and our institutions of higher learning that are sponsoring research in economic, social and cultural relationships. It is agreed also that the State agencies that wrestle with the problems of agriculture and labor can be of great value.

However, I wish to talk with you as the State's Treasurer and Chairman of the Local Government Commission. As you know, it is my duty to act as one of the State's guardians of public credit, seeing that your tax dollars are wisely and efficiently used and in the manner prescribed by our laws and the wishes of the people.

One of the great functions of the Local Government office is to counsel and advise the units as to sound financial programs and as to the wisdom of the projects for which they wish to issue bonds. This function has proved to be one of the greatest services that the State can render to the localities. Of course, they do not always agree with the Commission's decision, and, in keeping with the democratic principle, they have the right to go to the people in a referendum which may or may not affirm the decision of the Commission.

In recent years, it has become routine for our office to work with all levels of government. For example, just recently we were able to participate in a program which involved the Federal government in behalf of Anson County. The purpose of the project was to make the water resources in the area available to small rural towns within the County. The whole objective of the project was to develop rural parts of the

County by bringing in industries that would require a substantial and steady flow of water.

This project is currently well under way, and, if it succeeds, will be an example of what we may be able to do, not only in Appalachia, but in other parts of the State.

This whole matter of local units receiving grants from the Federal government must be handled by people with great experience in the issues involved. Federal grants are sometimes so attractive that a local unit loses its perspective and agrees to the incurring of debts beyond its reasonable ability to repay.

This is a delicate area; that is, the area in which the Local Government Commission seeks to give guidance to local units as they try to respond to an opportunity brought forward by the Federal government.

Notwithstanding all that has been said about the help of the State and the Federal governments, I regard the enthusiastic support of local county officials as essential. By this, I don't mean that mayors, city managers and county commissioners, as the case may be, will merely concur in proposals or act as a jury to hear the evidence and render a verdict pro or con. I mean that they will actively participate in the planning, contributing imaginative leadership. I am satisfied that we have in our county and city officials vital and dynamic leaders. I am sure that we can find among them men of stature and vision who have the ability not only to aid us in planning, but who can also interpret, and, some of those, "sell" a program to the people, who, in the last analysis, must be aware of all that is done.

All of us know of the fiscal and administrative limitations that have been placed upon local governments. I agree that the time is here to take a new look at these limitations and steps be taken to give local units more leeway in tax matters, more authority to carry the responsibilities that have been delegated to them. Of course, these limitations were placed there many years ago in order to promote sound government and guard the credit of the localities. So, any tendency toward liberalization must be cautiously studied because it is essential that we preserve the fine credit standing of our State and local governments.

There are many things that can be accomplished by a group of towns working together that could not be financed by one town working alone; and the same thing applies to counties. The shape of things to come is forecast in such things as the consolidation of Leaksville, Draper and Spray under the historic name of Eden City.

I do not expect to recommend the consolidation of our counties. They are deeply engrained in our political fabric and I do not think that our people desire to give up the traditions that they associate with these local units. However, I do see in the immediate future, a

step-up in the consolidation of functions among groups of counties. This has already been done in such wide-ranging matters as airports and library services. Our counties and cities have learned that by working together as a group and pooling their resources they can support a hospital or attract an important industry.

The Piedmont Crescent holds within its broad borders our most populous areas. The Triad challenges Greensboro, Winston-Salem and High Point to pool their resources. The Coastal Plains Regional Commission may accomplish for eastern North Carolina what the Appalachian program will do in the west. And, of course, the Research Triangle pools the resources of three great educational institutions located in three counties. These concepts are the product of regional thinking, which means that all North Carolina is alive with new and imaginative remedies for the problems of our age.

However, some of these concepts were rather vague and were, perhaps, ahead of our time. And many of our county and city officials felt that we needed new legislation to enable them to cooperate in a more practical way. So, the Legislature of 1967 passed an act permitting our local governments to organize themselves into regional councils. In plain language, this legislation points the way for legal cooperation among the officials of our counties and cities so that they may act in concert of programs in which they are mutually interested. The councils are to be financed by funds appropriated by its participating units, and the law sets out in detail the broad matters in which such councils can be concerned. This is a far-reaching piece of legislation which I commend to the leaders of local governments.

Sometimes cooperation among counties and cities is hard to come by. We all expect healthy competition among neighbors, but if the region is to be served, this competition must be blended with unselfishness. Often the effort to locate an airport or a hospital or a community college, comes to grief because of the inability of neighbors to put the best interest of the region above local pride. So, notwithstanding, loyalties to town and county, the leadership of our local officials must be cast in terms of what is best for the region if anything significant is to be accomplished.

As I intimated in the beginning, our consideration of the future of Appalachia may cause us to stretch our minds and to reorient our thinking about the proper role of all levels of government and private enterprise.

For instance, working with Appalachia may lead to a reappraisal of the relations between State and local governments. In answer to the criticism that the State has assumed the major sources of revenue, we should remember that two-thirds of the tax revenue of the State goes back to the localities in the form of direct or indirect aid. There are many examples of State aid to the localities, such as schools, highways,

city streets, the intangibles tax and, more recently, the judicial system.

I would now like to reaffirm my faith in the future of Appalachia. The problems are many, and we must be ready to meet them as they arise. Some of these are upon us now, while others cannot be solved for a period of years. But whatever difficulties face the counties and cities of this region, I want here and now to pledge to you all the help and assistance that our Local Government office can give.

The very moment this area is opened up by the great highways, every asset that you have will become more valuable. An industrial site that went unnoticed, suddenly becomes desirable and you may find industries actually bidding against each other for the privilege of becoming your corporate citizen.

Your county may contain within its borders a scenic asset of great beauty or a significant historical site; and when these assets become accessible to tourists, your economy will be enriched accordingly.

For instance, there is no place in North Carolina more remote than Dare County. And yet thousands of tourists go there to witness The Lost Colony and see the monument to the Wright Brothers. Why? Because this area became accessible through the building of bridges. And what shall we say of the potential value of this region of Horn in the West and Unto These Hills?

Every city and county in this region, if it has not already done so, ought to make a complete up-to-date evaluation of its natural, human and cultural assets in the light of changing conditions. Such a current inventory will be an indispensable tool not only in your hand but in the hands of all those who seek to help you.

And believe it or not, if we do our work well, there will be industries that will want to pay their own way, including even the construction of necessary utilities. Instead of asking for aid, they will contribute private capital to the economic growth of your communities.

The people of this region are our greatest asset. They are independent and proud, and are devoted to the basic principles upon which our country was founded. They prefer to do for themselves. And notwithstanding their almost fierce independence, they are kind and charitable and their hospitality is something to remember. They are the sort of people that are valued as friends and neighbors. And industry likes to employ them because of their stalwart, stable characteristics. If these people understand the issues, and if they set the opportunities of Appalachia over against the sacrifices entailed, I believe that they will give their enthusiastic support to the program that we have discussed

here today. And this is as it should be, for the future of this region rests, in the last analysis, with its own people.

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AREA PLANNING AND DEVELOPMENT ORGANIZATIONS

Planning in a democratic society is primarily a means of proposing possible future alternatives and explaining their probable consequences for public acceptance, rejection, or modification. For twenty years, western North Carolina has recognized the need to encourage this kind of planning for economic development.

Western North Carolina is a part of the Southern Appalachian Highlands. It is a land of contrasts with great economic potential, largely undeveloped. Historically, its central problems have been chronic unemployment and underemployment.

Four types of area organization are playing important roles in the planning process in this region, each complementing the work of the others. They are: (1) area development organizations; (2) chamber of commerce associations; (3) regional planning commissions; and (4) economic development commissions.

Northwest North Carolina Development Association

The Charter for this organization issued on May 21, 1954, says under Objects and Purposes, "A. To promote through regional cooperation the industrial, agricultural, and recreational well-being of the area comprising the Counties of Alleghany, Ashe, Davie, Forsyth, Stokes, Surry, Watauga, Wilkes, and Yadkin, in the State of North Carolina." Provision was made that the area might be increased or decreased as necessary. Two years later, Alexander and Caldwell Counties became members. Under Provisions of Membership, the Charter provides that membership in this corporation shall be available to all persons residing in the counties comprising the area within the corporation operates or who are interested in and are willing to give their time, talents, money, or materials to the work of the corporation.

In the beginning, the organization provided for one director from each of the nine counties; however, later this was changed so there are three directors, serving on a rotation basis, from each of the eleven counties - a secretary-treasurer, two vice presidents, and a president who becomes chairman of the board the year following his term of duty as president. Each of the four divisions, Agriculture, Industry, Travel and Recreation, and Community Development, has a chairman and vice chairman. No provision is made for any paid employee. Each county does pay the magnificent sum of \$50 per year to provide postage money and other incidentals. For the past several years, approximately \$4,500 has been raised for community improvement awards, and from time to time, various other projects have needed money. The money has readily been forthcoming from a great number of contributors throughout the area. For the

most part, these have been industries and commercial concerns of one kind or another operating within the eleven counties.

In President James Boyles' annual report made in December, 1966, his opening sentence is, "Northwest North Carolina is a better place in which to live because of the individual responsibility many have accepted in all phases of its development." President Eugene Seats, in his message in the 1967 Annual Report says, "The aim of this organization when conceived in 1954 was the same as it is today - to make our area a better place in which to live, work, and play. The first year carried us nearer this goal, and we have been continually moving this way each and every day since. And, it is not at all discouraging to observe that to many of us, this goal may be 'always in sight . . . always attainable . . . yet never attained.'" In summary, Mr. Seats says, "All this is but to point out that the greatest asset of the Northwest North Carolina Development Association is that of continuity. In general, we have stuck to the program originally adopted in 1954 . . . improving it year by year . . . making it work to improve northwest North Carolina. Down through the past 14 years, only the faces of the leadership of this organization have changed . . . not the aims and objectives. These have continued and will continue on into the future."

Western North Carolina Associated Communities

In 1946, Western North Carolina Associated Communities was established to promote programs of regional interest. Chambers of Commerce in eleven counties pay annual fees of \$10 and name representatives to attend quarterly meetings. There is no paid staff; the principal expense is for duplication and postage. Associated Communities is an effective idea-hatching organization. Many of these ideas have been implemented through concerted community action. It has been credited with conceiving the North Carolina National Parks, Parkway and Forests Development Commission, the outdoor Indian drama, "Unto These Hills," and Western North Carolina Regional Planning Commission.

Asheville Agricultural Development Council

In the early 1950's, the Asheville Agricultural Development Council was formed as a result of an area study conducted by Dohn of St. Louis. The Council, serving eighteen western counties, is North Carolina's first rural community development organization. Its full-time staff of two is supported by the area's business and civic leaders. Organized communities are encouraged to establish youth development and roadside beautification programs, as well as community improvement projects.

In these days, where we see a rapid decline taking place in number of farms and farm workers and the many "unsolvable" farm problems, it

may seem strange to be talking about a development program so closely tied to agriculture and the rural economy. This is particularly true as relates to an area such as western North Carolina, which is characterized by very small farms, a mountainous terrain, over 75 percent of the land in forests, and by a heavy percentage of part-time farmers.

Much effort has gone into this program over the past 19 years - plus money. The folks in our area - business, industry, farmers, and local government - have spent about one million dollars in support of this rural development program since it was launched, not to mention time beyond count. They did this for just one reason - because they have seen results!

The Agricultural Council embraces an area of 18 counties with a population of approximately one-half million. The program is operated by a board of directors representing all counties, with numerous enterprise promotion commissions. Financing is supplied by local government, business and farm interests.

That significant gains have been made in increasing farm income and in stimulating rural progress in our 18-county area can be seen by a look at the record. Cash receipts have more than doubled, going from \$38 million in 1950 to \$95 million in 1967.

We have gone from a milk-importing to a milk-exporting area. Sales of Grade-A milk by area farmers increased by three times from 1950 to 1967, with the sales value now running near \$13 million annually.

Poultry sales amounted to \$4.5 million in 1950 and to over \$22 million last year.

Volume of cattle marketed has increased sharply, with sales now exceeding \$12.5 million annually.

Production of horticultural crops - fruits, vegetables, and ornamentals - has increased at a rapid rate, now amounting to \$25 million - over triple the 1950 level.

We completely reject the theory that agriculture is becoming much less important and should be relegated to a minor position in development efforts. This may be true when viewed from the standpoint of number of farm units and full-time farmers. It is far from true from the standpoint of the dollar importance of agriculture and the agri-business sector of the area's economy. Farm progress has stimulated industrial growth. New processing plants and marketing facilities for farm products have arisen, resulting in expanded employment and greater income.

Western North Carolina Regional Planning Commission

The Western North Carolina Regional Planning Commission, formally established in the Summer of 1957, was the first regional planning organization in North Carolina. In 1959, State legislation was passed creating the Research Triangle Regional Planning Commission; and in 1961, the General Assembly enacted legislation authorizing any combination of local governments to establish regional planning organizations.

The seventeen westernmost North Carolina counties and the municipalities therein are now served by the Western North Carolina Regional Planning Commission, each governmental unit naming a representative. Dues are proportionate to population with \$50.00 set as a minimum and \$1,000.00 as a maximum. Payment received for extra services rendered to individual members augment the budget.

Quarterly meetings of the full membership are held throughout the region. Interested local leadership is invited to attend these meetings. Current planning issues of area-wide interest are fully discussed. An Executive Committee, made up of the Commission's officers and a selected representative from each county, holds monthly meetings. This Committee formulates policies guiding the work of the full-time technical staff based in the Commission's Asheville offices.

It was agreed at the outset that the Commission's success would depend on strong local support. At the time of the Commission's beginning, no sustained planning effort was being maintained at either the local or county level, except in the City of Asheville. Since then, municipal and county planning boards have been established in most, if not all, localities; and they are continuing to pose alternatives for their respective governing bodies.

The first significant step was taken toward the development of a regional plan in 1959, when the Commission's Executive Committee decided to undertake a study of the economic potential of the areas. Hammer and Company Associates of Atlanta was employed as economic consultant to work with the Commission on this study. Investor-owned utilities serving the Region helped underwrite the costs. The final report, entitled The Economy of Western North Carolina, was published in 1961. The study was one of the first of its kind dealing with a large sub-area of a state. The report has been widely read and continues to be quoted by leaders in the area.

When Congress passed the Area Redevelopment Act in 1961, designated counties within the Western North Carolina Regional Planning Commission were ready to participate. These county planning boards prepared Overall Economic Development Programs, assisted by their county technical action panels and the staff of the Regional Planning Commission. Some of the first OEDP's approved by the United States Department of Commerce came from this group. Many local leaders believe that the principal

long-run benefits of the ARA program will be measured in what organizational strength was developed rather than the number and value of projects constructed.

The Western North Carolina Regional Planning Commission has maintained a serious interest in the Appalachian Program since it was conceived by the Conference of Appalachian Governors in 1960. The Commission's officers have participated in meetings held in Washington and elsewhere and have indicated their strong support for the Appalachian Regional Development Act of 1965.

Multi-County Economic Development Commissions

The Appalachian Act designated 29 North Carolina counties as a part of the Appalachian Region. Eighteen of these are in the service area of the Asheville Agricultural Development Council, and the remaining eleven are in the Northwest North Carolina Development Association.

This Act provides for the formation of action-oriented, multi-county local development districts as an essential part of the program. Three-quarters of the operating cost for these districts are borne by the Federal government, and the non-Federal share of the cost is provided by county government. Similar provisions are included in the Public Works and Economic Development Act of 1965, but these two programs may not provide for district financial assistance simultaneously.

The Appalachian area has been divided into seven districts, using boundaries drawn with the advice and concurrence of the local leadership. Each of these districts constitutes an Economic Development Commission according to the provisions of a 1961 General Statute.

County commissioners from each county have participated in the establishment of the districts by joint resolutions and have named three members, usually with preference given to leaders in existing area development and planning programs. A field coordinator and secretary were selected from qualified persons living within each district.

District staff members serve at the pleasure of the Governor and report to him through the North Carolina State Planning Task Force. The Task Force, a part of the Department of Administration, is responsible to the Governor for statewide coordination and planning. The Task Force provides staff assistance for North Carolina's Appalachian Representative, John R. Hampton.

It is hoped that by 1975, each of these districts will have the necessary facilities for attracting sufficient private capital to realize the districts' growth potential. A senior college, an airport, health facilities, vocational education centers, an adequate highway

system, water supply, and sewerage systems would be included on any such list.

The ultimate goal of planning for the economic development of western North Carolina must be the establishment of comprehensive employment opportunities for all of its labor force. Such a condition can only be realized when both public and private sectors of the economy are in complete harmony and both are providing their proper share of the total effort. Each of the four development groups cited in this report has made a valuable contribution to this relationship, and each is expected to play an even more significant role in the future progress of the region.